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By Jim Heid
Macworld's "Getting Started" Columnist

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"Thanks for a great and informative book! You covered every topic I could possibly have questions about." – Ryel Kestenbaum, as posted on *America Online*

MACWORLD COMPLETE MAC HANDBOOK
SYSTEM 7 QUICK REFERENCE

Finder Shortcuts

To Accomplish This...	Do This...
Eject a disk and remove its icon	Drag the icon to the Trash or select the disk and choose Put Away (Command-Y).
Bypass the warning dialog box	Press Option when choosing Empty Trash.
Select an icon from the keyboard	Type the first few characters of its name.
Hide the current application when switching to another application	Press Option while choosing the desired application from the application menu.
Rename an icon	Select it, press Return, and then start typing.
Quickly determine whether a file is locked or unlocked	Select the file and press Return. If no border appears around the name, the file is locked.
Organize icons by name	Choose By Name from View menu, then choose By Icon or By Small Icon. Next, press Option and choose Clean Up by Name.
Clean up everything	Press Option and choose Clean Up All.
Clean up selected items only	Press Shift and choose Clean Up Selection.
Close all disk/folder windows	Press Option while clicking a close box or choosing Close.
Copy a file from one folder to another instead of moving it	Press Option while dragging the file to the destination folder.
Open an item and close its window	Press Option and double-click on the item.
Open the folder or disk window that holds the current directory window	Press Command while clicking on the window title, then choose desired folder or disk name.
Abort a program that seems to have crashed	Press Command-Option-Esc and click Force Quit.
Open a document using an application that may not have created it	Drag the document's icon to the application's icon.

Finder Keyboard Command Shortcuts

File menu

New Folder	Command-N
Open	Command-O
Print	Command-P
Close	Command-W
Duplicate	Command-D
Put Away	Command-Y
Find	Command-F
Find Again	Command-G

Edit menu

Undo	Command-Z
Cut	Command-X
Copy	Command-C
Paste	Command-V
Select All	Command-A

Special menu

Eject Disk	Command-E

FINDER WINDOW SHORTCUTS

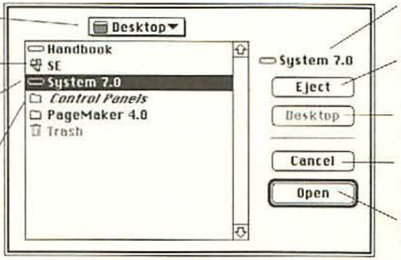
- Command-down arrow opens icon
- Tab selects next icon alphabetically; Shift Tab selects previous
- Left and right arrow selects next or previous icon
- Command-right arrow expands folder outline; Command-Option-right arrow expands entire outline (Left arrow to collapse)
- Command-up arrow opens the window that holds active window

MACWORLD COMPLETE MAC HANDBOOK
SYSTEM 7 QUICK REFERENCE

by Jim Hei

Open and Save Dialog Boxes

System 7 provides standard Open and Save dialog boxes, whose components and keyboard shortcuts appear here. Some programs may not use these components or may add additional options of their own.



Use this pop-up to access other folders above this one

File server volumes have this icon

To quickly select a folder, drive, or document, type the first few characters of its name.

Alias indicated by italics

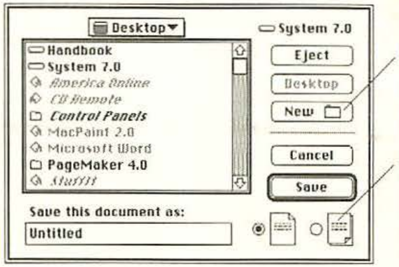
Click here to close an open folder

Command-E is the same as clicking Eject

Command-D is the same as clicking Desktop

Command-period is the same as clicking Cancel

Return is the same as clicking Open

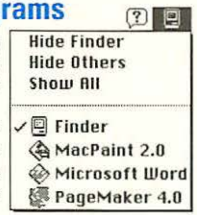


Pressing Tab in the Save dialog box lets you move between the list box and the text entry box. When a bold border appears around the list box (as shown here), you can select items in the list box by typing characters. When the bold border appears around the text box, characters you type appear in the text box.

Lets you create a new folder (keyboard shortcut: Command-N). If you've already opened a folder, the new folder is created within it.

Lets you create a stationery pad. Stationery pads let you reuse a document's contents without accidentally saving over them.

Switching Between Programs



Hides current application (here, the Finder)
Hides windows of inactive applications
Displays all hidden windows

Check mark denotes active application
Press Option and choose to hide active application
Dimmed icons indicate inactive applications whose windows are hidden

To switch to a different program, click within one of its windows, if any are visible. You can also use the application menu (at the right edge of the menu bar) to switch between programs and hide the windows of programs you aren't using.

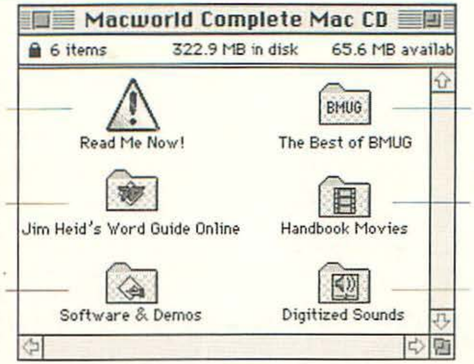
File Sharing Icons and Access Priviliges

Icon	What it means
🗀	You can put items in this folder but you can't open the folder or access its contents
🗀	You can't access or modify this folder
🗀	You can use this folder normally
🗀	You own this folder and can use it normally

ICONS IN DIRECTORY WINDOW HEADINGS

You can't make changes to this folder.
You can't see files within this folder.
You can't see folders within this folder.

MACWORLD COMPLETE MAC CD QUICK REFERENCE



For an overview of the CD, double-click this icon.

An electronic guide to Microsoft Word

Demonstration versions of many top programs

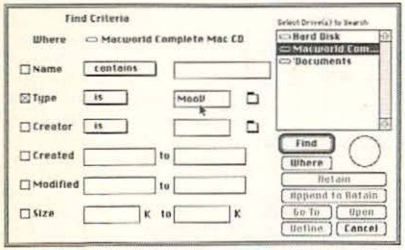
20MB of free software and shareware

QuickTime movies: PowerPC interview, PlainTalk, and more

Error beep sounds, music, PlainTalk demo, and more

Using DiskTop to Search for Files

You can use CE Software's DiskTop (it's on the CD, in the CE Software folder) to search the CD for certain types of files—in this example, QuickTime movies. The table below lists the types of files you might want to locate. Be sure to type the four-character file type exactly as it appears here.


Find Criteria

Where: Macworld Complete Mac CD

☐ Name contains

☒ Type is MooV

☐ Creator is

☐ Created to

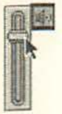
☐ Modified to

☐ Size K to K

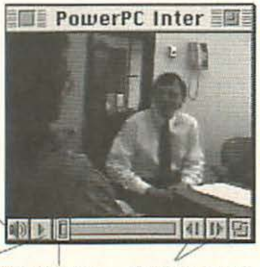
Select Drive(s) to Search: Hard Disk, Macworld Com..., Documents

To display the dialog box here, click the Find button in DiskTop's main window.

To search for...	Specify this file type...
HyperCard stacks	STAK
Graphics	PICT
Adobe Photoshop files	8BIM
SoundEdit Pro files	jB1 (type a space after 1)
Other sound files	AIFF or sfil
Control panels	cdev
QuickTime movies	MooV



Drag the slider to adjust sound volume



Volume control button—click to display the slider above

Play button (changes to Pause during playback)

The slider moves across the play bar during playback

Step buttons move backward or forward by one frame

Playing QuickTime Movies

To play and navigate QuickTime movies, you use the standard QuickTime movie controller shown here.

Movie Navigation Techniques

To Do This...	Do This...
Jump to a certain spot	Drag the slider
Select some frames	Press Shift while dragging the slider

MACWORLD COMPLETE MAC HANDBOOK TIPS AND SHORTCUTS

by Jim Heid

Making Your Text Look Typeset (All System Versions)

To make your text look professionally typeset, use the special characters shown here.

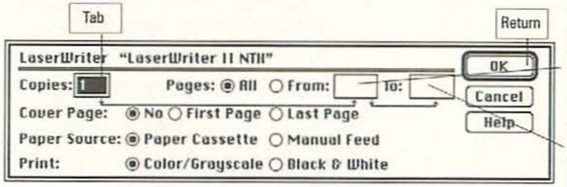
Char.	Key Combination	Example of Usage
“	Option-[	He said, “I think so.”
”	Shift-Option-[	
‘	Option-]	She said, “That's ‘odd.’”
’	Shift-Option-]	That's the way to do it.
—	Shift-Option-hyphen	I'll be back—you'll see.
–	Option-hyphen	5–10 feet long.

MORE TYPE TIPS

- Type one space after punctuation, not two.
- Don't type "l" for 1 or "O" for zero.
- Commas and periods go inside quotes.
- Colons and semicolons go outside quotes.
- Use italics, not underlines, for emphasis.
- Use tabs, not the spacebar, to align text.
- For better legibility, avoid all CAPITALS.

Shortcuts for Dialog Boxes with Text-Entry Boxes

In dialog boxes containing multiple text-entry boxes, you can jump from one text box to the next by pressing the Tab key. Other shortcuts for the Print dialog box are shown here.



LaserWriter "LaserWriter II NTII"

Copies: 1 Pages: ● All ○ From: To:

Cover Page: ● No ○ First Page ○ Last Page

Paper Source: ● Paper Cassette ○ Manual Feed

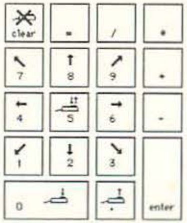
Print: ● Color/Grayscale ○ Black & White

To print from a certain page through the end of a document, type the starting page number here, leaving the To box blank.

To print from the beginning of a document through a certain page, type the ending page number here, leaving the From box blank.

Using Easy Access' Mouse Keys Feature

The Mouse Keys feature of the Easy Access control panel lets you control the pointer using the numeric keypad. To activate and deactivate Mouse Keys, press Command-Shift-Clear. When the Mouse Keys feature is active, the keypad's keys move the mouse pointer as shown below.

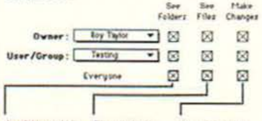


To deactivate Mouse Keys, press the Clear key on the numeric keypad. Use the Easy Access control panel to adjust pointer speed.

SHARING STRATEGIES

To share a hard drive and grant all privileges to anyone who accesses it, first activate file sharing using the Sharing Setup control panel. Then, select the drive, choose Sharing (File menu), and configure the sharing window as shown at right.

To assign privileges to a specific folder, select the folder and choose Sharing. Then specify the folder's owner and (if applicable) group. Finally, specify the desired privileges for the owner, the user or group, and everyone else.

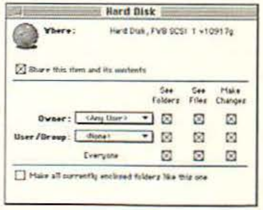


	See Folders	See Files	Make Changes
Owner: Roy Taylor	☒	☒	☒
User/Group: Testing	☒	☒	☒
Everyone	☒	☒	☒

Any folders within the shared folder can be seen.

Files within the shared folder can be seen.

Changes can be made to the shared folder.


Hard Disk

Where: Hard Disk, FWB SCSI 1 v1091?g

☒ Share this item and its contents

	See Folders	See Files	Make Changes
Owner: <Any User>	☒	☒	☒
User/Group: <None>	☒	☒	☒
Everyone	☒	☒	☒

☐ Make all currently enclosed folders like this one

A shared drive or folder icon looks just like any other server. Make an alias of the icon for convenient future access.

MACWORLD
Complete Mac Handbook
Plus CD,
2nd Edition

By Jim Heid,
Macworld magazine
"Working Smart" columnist

IDG BOOKS

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Dedication

To Maryellen and to my mother;
and in loving memory of Suzanne Raynak, who started it all.

Acknowledgments

The columns and articles you read in *Macworld* and the chapters you will read in this book aren't the product of one person; they're the result of a collaborative effort of many, and they all have my sincere thanks and gratitude.

Topping the list is *Macworld* magazine's talented staff, the best group of computer journalists and consumer advocates I've ever had the honor of working with. In the departments section, thanks go to Nancy Dunn, who originally proposed my "Getting Started" to me and who was instrumental in shaping the column's style and scope; to Cathy Abes, who picked up the torch when Nancy left; and to Dan Littman, who helped me make the transition from Mr. Getting Started to Mr. Working Smart. Thanks also go to Deborah Branscum, who expertly supervised the magazine's departments section until being promoted to Executive Editor, and whose Conspicuous Consumer column always educates and enlightens.

On the features side, my thanks and respect go to Charlie Piller, Galen Gruman, Jim Martin, Cheryl England, Suzanne Stefanac, and Liza Weiman. Their work has been an inspiration over the years, and their tolerance of the occasional missed deadline — especially as this book came together — is truly appreciated. Thanks also to *Macworld's* expert copy editors, whose love of language makes *Macworld's* writers look good and whose attention to detail never fails to amaze.

On the design and production side, warm gratitude goes to Arne Hurty, who created the gorgeous informational graphics in this book. Arne can make Aldus FreeHand sing, and his cheerful personality and dedication to his art make him a pleasure to work with. And I'm indebted to Assistant Managing Editor Luis Camus, who dug through megabytes of archives to supply me with disk files of the technical illustrations in this book. (See Appendix B for a look at how this book and its CD were produced.)

Special thanks go to Jerry Borrell for his support of the first edition of this book; and to Adrian Mello, who has been a steadfast supporter and friend since 1984.

I also appreciate the efforts of everyone in Macworld Lab — Mark Hurlow, Tim Warner, Danny Lee, Matthew Clark, and Lauren Black. These are the people who live in the trenches with Macintosh products, running hundreds of tests over thou-

sands of hours so that *Macworld* can guide you to the best products and away from the worst ones. On the administrative side, my thanks go to Jane Lagas and Lyn Taylor.

I also want to thank all the experts of the Macintosh world who have shared their knowledge with me over the years, and the press and marketing representatives who helped supply me with company and product information and demonstration software for the CD. There are too many names to list here, but they know who they are, and they have my gratitude.

My warm thanks also go to Dennis Cohen, the technical editor of this book and a good friend. Dennis has forgotten more about the Mac than I'll ever know, and he's been a superb source of technical information and insights over the years. The Macintosh world is lucky to have him in its ranks. If he had stayed at the Jet Propulsion Laboratory, we'd have colonized the solar system by now.

Several people at Adobe Systems helped arrange and produce the Adobe Acrobat demonstration file that appears on the *Macworld Complete Mac CD.* They include Patricia Pane, Kathy Kruse, Christopher Warnock, and Bob Shanahan. At Sony's Digital Audio Disc Corporation, Sean Smith, Tamara Crabaugh, Richard Gold, Kurt Smith, and Liz Zacarias were instrumental in seeing the CD through production. And I couldn't have done the CD without a Porsche of a hard drive — an FWB Hammer1000fmf — provided by David Lamont and Mike Micheletti. Thanks also go to the Berkeley Macintosh Users Group and everyone at BMUG who compiled The Best of BMUG collection. And even more thanks go to the skilled and generous programmers who created the software.

Then there's Apple. I may not agree with everything that comes out of Cupertino, but I've always been impressed with the skill and dedication of Apple's engineers and product managers. I'd like to thank all Apple representatives who have taken time from hectic schedules to answer questions. They include (but aren't limited to) Vito Salvaggio, Dave Rothschild, Brad Blietz, Steve Goldberg, Steve Rea, Duane Schulz, Charlie Oppenheimer, Paul Hudspeth, Jim Stoneham, Karen Ebert, Mark Orr, Paul Prebin, Mario Diaz, Fred Parker, Jack Palevich, Jim Gable, Dave Garr, Michael Mace, Jim Stair, Neil Selvin, Bryan Stearns, Donn Denman, Kevin Jones, and Randy Carr. Thanks also to Kathleen Dixon and Mary Zavisia for supplying me with the Mac's 1984 introduction video that I used when producing the audio portion of this program. And special thanks go to Frank Casanova, for his assistance and support over the years and for agreeing to share his PowerPC expertise and insights with me — and with you.

My heartfelt thanks also go to the folks at IDG Books Worldwide, the most innovative book publisher I've ever worked with. Specifically, I want to thank John Kilcullen, for his inspiring enthusiasm and for having the vision to realize what a nifty book this could be (especially if it included a CD-ROM); and Jeremy Judson, for expertly shepherding the book through the production process and for patiently listening to my answering machine more often than he should have had to. Thanks also go to Janna Custer, Meg Bonar, Patricia Reynolds, and Erik Smithart. In the production trenches, a tip of the printer's visor goes to Peppy White and the rest of the gang at University Graphics in Palo Alto, CA, who handled this book's tricky production demands with aplomb.

And finally, the home front. My buddy Kevin Fraser helped get me through the worst of it and introduced me to the wonders of the Northern California coast. Trixie was a sweet and constant companion who always seemed to know when it was time for a squeak-squeak break. (You can see Trixie in action in Chapter 21.) And the love of my life, Maryellen Kelly, was there, as always, reading every word, running everything, and providing love and support that continues to make it all worthwhile.

(The publisher would like to give special thanks to Patrick J. McGovern, without whom this book would not have been possible.)

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— John Kilcullen
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The text in this book is printed on recycled paper.

About the Author

Jim Heid has been writing for *Macworld* since 1984, and has appeared in every issue since March 1985. In the early days, he edited the popular "Open Window" reader tips column. From 1986 through 1993, he wrote the award-winning "Getting Started" column, which focused on a different aspect of Mac fundamentals each month. He currently writes the "Working Smart" column, which provides productivity tips and techniques for people who use the Mac in business. Heid is also a regular contributor to *Macworld*'s features and reviews sections, specializing in Mac technology, printers, publishing, typography, MIDI, and digital audio — a mix that exploits his background as a typographer, musician, and audio buff. (He grew up in his father's recording studio, which was Pittsburgh's first.)

Prior to writing for *Macworld*, Heid was Senior Technical Editor for *Kilobaud Microcomputing* magazine, where he began writing about the Mac several months prior to its introduction. He has been working with and writing about personal computers since the late seventies, when he computerized his home-built ham radio station with one of the first Radio Shack TRS-80s. He is the author of numerous bestselling books on Macintosh and DOS PC personal computing including *Macworld Complete Mac Handbook* and *Macworld Guide to Microsoft Word 5*, and frequently speaks at user group meetings, developers conferences, and Macworld Expos. He also teaches electronic publishing and typography at the Kodak-founded Center for Creative Imaging in Camden, Maine. He and his wife live on California's scenic Mendocino coast.

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Foreword

Jim Heid is one of the most experienced Macintosh writers in the industry. From 1986 to 1993, he wrote *Macworld's* "Getting Started" column, which introduced readers to Macintosh fundamentals and products. Jim's latest column is called "Working Smart," and provides insights and tips for increasing productivity and mastering the Mac and its programs. This more-advanced focus addresses the fact that the Mac world — and Macintosh users — have become more sophisticated over the years.

Jim's experience with the Macintosh makes him uniquely qualified to explain new concepts to beginners and to help experienced users who are venturing into new territory. This is evident in this updated and expanded second edition of the *Macworld Complete Mac Handbook.* In addition to lucid descriptions of Mac software and hardware concepts, you will find new Quick Tips boxes that help you discover the buried treasures of the Mac; Background sidebars that elaborate on the concepts discussed in each chapter; and Step-by-Step boxes that walk you through the Mac world's most popular programs. You will also find more beautiful technical illustrations created by *Macworld* illustrator Arne Hurty.

Some of the most significant trends in the Mac world involve the growing popularity of dynamic data such as digital video and sound. Not only does this second edition contain expanded coverage of these areas, it also includes a CD-ROM that illustrates them. The *Macworld Complete Mac Handbook Plus CD,* 2nd Edition is the first book that lets you experience QuickTime, sound, and speech technologies instead of just reading about them.

If you're shopping for software, you can try out some programs for yourself. If you're a Mac aficionado, you can hear Steve Jobs introducing the first Mac in 1984. If you're curious about what lies ahead, you can watch an interview with one of the Apple product managers responsible for the PowerPC chip, which will drive the next generation of Apple computers.

If you don't have a CD-ROM drive but you do have a stereo CD player, you can listen to the CD's audio program — an entertaining look at the Mac's first decade. (Jim's Mac experience helped here, too — he recorded and produced the entire audio segment using the Macintosh.) In short, there is something on the *Macworld Complete Mac CD* for everyone.

You could say the same thing about the *Macworld Complete Mac Handbook Plus CD,* 2nd Edition. Whether you want to learn how to set tabs in your word processor, buy a database program, fight off a computer virus, or understand digital video and QuickTime, you will find the answers you need right here.

— Adrian Mello
Editor in Chief
Macworld magazine

Foreword

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[illegible]
Editor in Chief
Macworld magazine

Introduction

These days, it's common for a computer book to include a floppy disk or two with some software.

Welcome to the first Macintosh book that includes 235 floppy disks. That's roughly the equivalent capacity of the *Macworld Complete Mac CD* tucked into the back cover of this second edition of the *Macworld Complete Mac Handbook*. What better way to illustrate the diversity of the Macintosh world and the wide range of tasks that a Mac can perform? The Macworld Complete Mac CD gives you the Macintosh world on a silver platter.

So much has happened since the first edition's release in 1991. The PowerBook, Performa, Centris, and Quadra families were introduced, and the Mac family tree has reached sequoia-size proportions. The Mac line used to be simple and expensive; now it's complicated and inexpensive. System 7 — the fundamental software that enables the Mac to run — has become the dominant system software in the Mac world. Digital video is pervasive — like it or not, television and personal computers are on a collision course. And Macs have begun to sport the kinds of features that many people always dreamed or dreaded computers would have: the ability to act on spoken commands.

Bigger and Better

This second edition covers these new developments and provides greatly expanded coverage of mainstream application areas — word processing, spreadsheet analysis, database management, graphics, communications, and electronic publishing.

The chapters in this book are loosely based on the monthly columns, features, and reviews that I've been writing for *Macworld* since 1984. But these aren't just reprints — far from it. Every chapter contains new sections, illustrations, tables, product listings, and sidebars containing additional background, tips, step-by-step instructions, and insights.

At the same time, I've retained the magazine-style format of the original stories. You'll find comprehensive figure captions (not just "Figure 2-1: A dialog box"), and award-winning informational graphics — items you'd expect from a magazine, not a book. As with the first edition, I've aimed for the best of both worlds — magazine-style layout and graphics along with the depth and scope only a book can provide.

Whom This Book is For

This book is intended for the following people:

- People who are thinking about purchasing a Macintosh and need an introduction to Mac terminology, operating concepts and capabilities
- Experienced Mac users who want a one-stop reference to the Macintosh world as well as overviews of Macintosh application categories and hardware concepts to help them choose products and brush up on areas they're unfamiliar with
- Regular *Macworld* readers who want an updated and expanded collection of my jibberish for convenient reference

How This Book is Organized

Most computer books begin with chapter after chapter of technical background on bits and bytes and how computers work. But in my experience, the first questions people ask about the Mac aren't "how does it work and what do all those weird words mean?" but "which machine should I buy and what can I do with it?" That only makes sense: Whether you're shopping for a car, a house, or a computer, your first priorities are making an informed purchase and then applying that purchase to your daily life. Learning the technical details usually comes later.

For this reason, this book is organized a bit differently than the rest.

Part I: Using the Mac

In this part, I get right down to business, examining issues you will want to investigate when shopping for a Mac system, and looking at the many ways you can put a Mac to work. You'll explore the worlds of word processing, desktop publishing, spreadsheets, database management, animation, music, computer-aided design, and more. Each chapter in this part describes the concepts behind an application category and spotlights the leading products in the field. Most chapters have step-by-step boxes that provide detailed instructions for performing various tasks using the most popular programs in that category. You will also find tips for using your programs more effectively, and some shopper's guidelines that will help you choose programs that meet your needs.

As you read this part, check out the "On the CD" boxes on the first page of many chapters. These boxes list relevant programs on the *Macworld Complete Mac CD.* When you've finished a given chapter, you may want to explore the corresponding software to get direct experience with the programs and concepts you've read about.

Part II: Mastering the Mac

In this part, I take a closer look at what makes the Mac tick and show how to master System 7's most powerful features. This part looks at more advanced topics such as protecting your Mac from computer viruses, customizing your Mac, backing up, exchanging data between programs and computers, troubleshooting, and getting the most out of your printer. (Did you know your laser printer can print iron-on T-shirt transfers?)

The *Macworld Complete Mac CD* will come in handy as you read this part, too. The CD is packed with free or nearly-free software compiled by one of the Mac world's biggest and best user groups — the Berkeley Macintosh Users Group (BMUG). In The Best of BMUG collection (which was compiled exclusively for this book), you will find utility software for customizing and enhancing your Mac and virus protection programs to safeguard it.

Part III: Expanding the Mac

In this part, I look at the kinds of add-ons you might buy to round out your Mac system. Memory, monitors, printers, high-capacity disks, trackballs, and expansion cards are among the hardware vying for your hard-earned money. You will learn what each type of add-on has to offer and what to look for when shopping.

Conventions Used in This Book

This book contains several types of sidebars, each of which presents a certain type of information.

If a particular chapter has corresponding software on the *Macworld Complete Mac CD*, the software is listed in this box, which appears on the first page of the chapter. To quickly locate a program mentioned in this box, use the Finder's Find command. (See Appendix A for more tips on locating things on the CD.)

The Background boxes provide additional insights into the subject at hand — the kind of information you may not need if you're just skimming a chapter, but that may be valuable when you need more details on a given topic.

Quick Tips boxes provide, well, quick tips — short, to-the-point time-savers. If you've picked up this book on a rainy day, you may just enjoy browsing the Quick Tips boxes to find shortcuts for your favorite programs or peripherals.

The Step-by-Step boxes provide detailed, stepwise instructions that show how to perform a specific task using a specific program. Even if you don't use all of the programs covered in these boxes, reading the steps will give you a feel for how Mac programs approach various tasks. (Some of the programs covered in Step-by-Step boxes are included on the *Macworld Complete Mac CD*, so you can try the steps out for yourself.)

These boxes contain tips or background information specific to the PowerBook and PowerBook Duo computers.

The Rest of the Story

Finally, several appendixes describe the contents of the *Macworld Complete Mac CD* and provide detailed information on Mac memory configuration options. And the Quick Reference card in the front of the book lists essential System 7 tips and techniques and provides a quick roadmap to the CD.

You may find that some information and definitions appear in more than one place. As I worked on each chapter, I removed most of this duplicated information, but there are some common terms or concepts that are so important that I've left them in each place they appear. This will allow you to skip around from chapter to chapter without worrying about encountering too many unfamiliar terms.

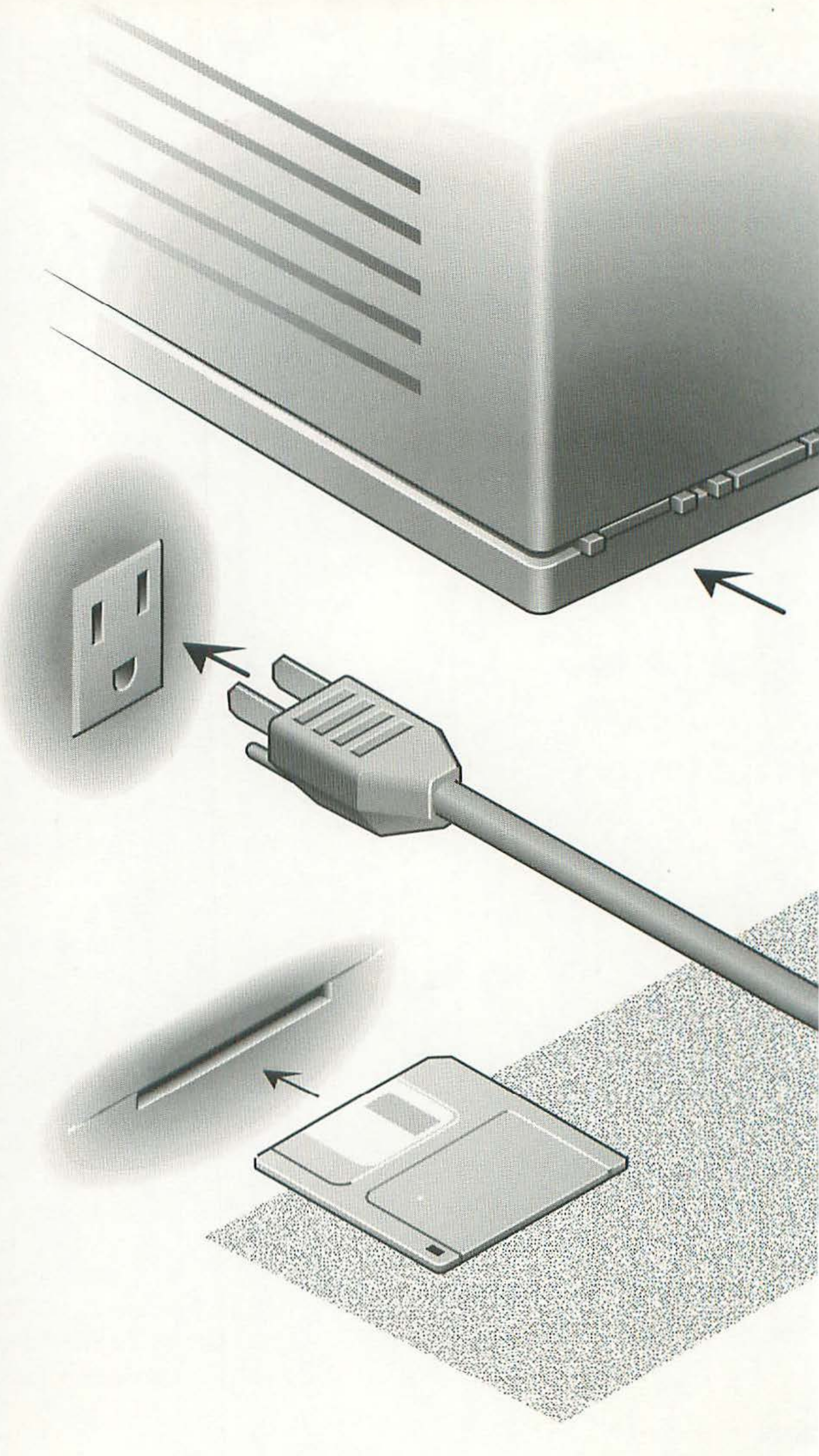
Feedback, Please

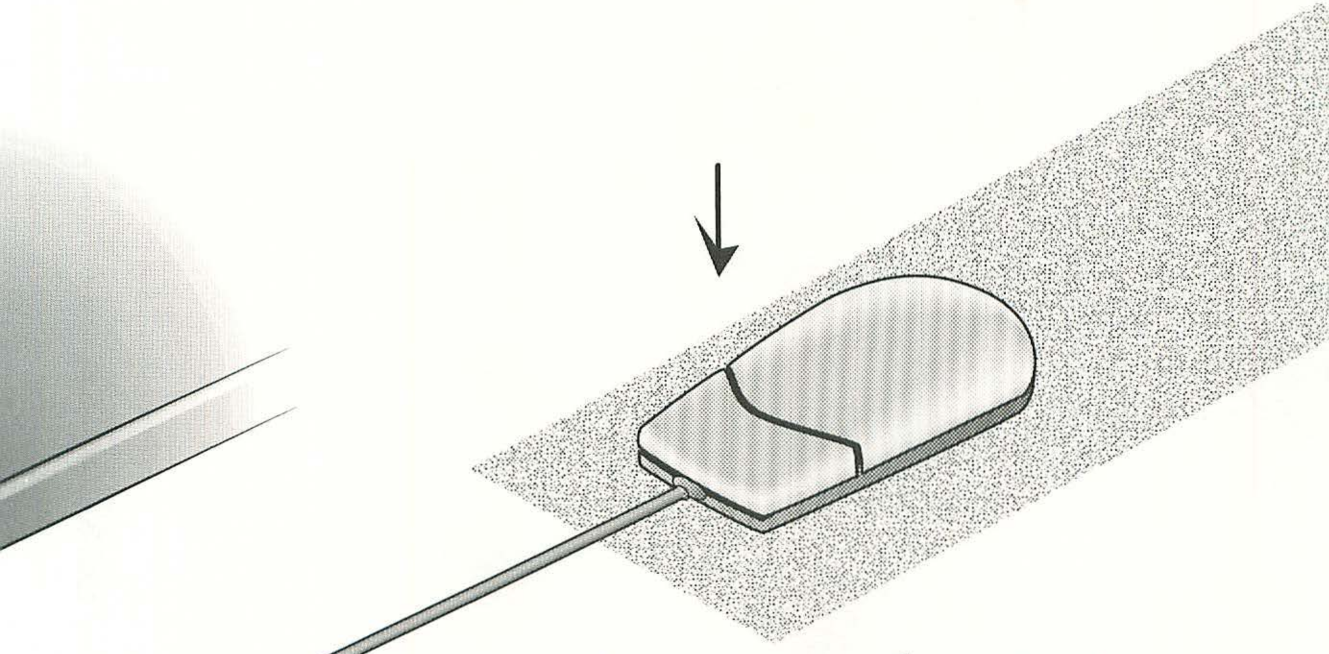
The letters and comments I've received from *Macworld* readers have helped set the magazine's direction. Similarly, your feedback to this book will help make future editions better. Please write to me, in care of IDG Books Worldwide, with questions or comments. You can also contact me directly using electronic mail (if you don't know what that is, don't worry — it's covered in the book). On CompuServe, send messages to 76174,556. On America Online and AppleLink, I'm JimHeid. On MCI Mail, they call me JHEID.

Let's get started!

—Jim Heid

PART I





Using the Mac

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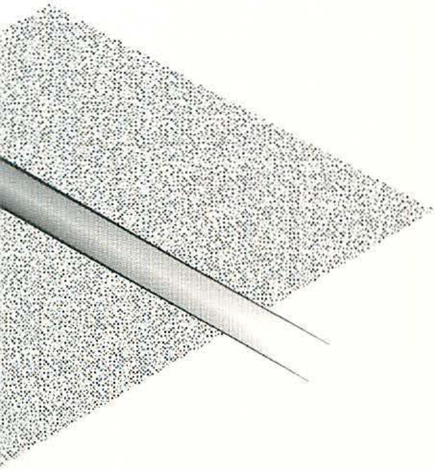


CHAPTER ONE

Macintosh Basics

IN THIS CHAPTER

- Buying a Mac — how to determine your needs
- Getting acquainted with the Mac's interface
- Understanding and unscrambling Mac acronyms

Today's Macintosh shopper faces more decisions than the president on a bad day. Apple offers numerous Mac models, each offering different features and performance, and each taking a different toll on your bank balance. Hundreds of independent, or *third-party,* manufacturers supply thousands of programs and hardware add-ons. You can outfit a system using only Apple hardware, or combine components from different firms. You can shop at a local dealer, or through the mail. Buy the right system, and you'll wonder how you got along without it. Buy the wrong one, and you'll feel betrayed by technology as you watch it depreciate and collect dust.

I begin this chapter by guiding you through the maze of issues you need to consider when assembling a Mac system, with the goal of helping you decide what combination of hardware is best for you. If you've already bought a Mac, feel free to skip to the section "Understanding the Mac's Interface" on page 24.

Money Is Everything

Many consultants and experienced users suggest that you answer the following questions to determine what Mac to buy:

1. What tasks do I want to use the Mac for?
2. Which programs can perform them?
3. What kinds of hardware do those programs require?

This is a valid approach, but I like to preface it with a more pragmatic question: How much can you spend? The fact is, what you *want* a Mac to do and what the system you can afford *can* do are often two different things. Thus, you can't accurately answer the first question until you determine your budget.

Addressing your finances is especially important in the Mac world, where "bargain" often means "less than a car." I'm exaggerating, but it is true that most Macs generally cost more than the other major personal computing standard, the DOS PCs and clones. But the Mac is easier to set up and learn. If your time is worth money, the system's higher cost may easily be offset by the time you save learning it, especially if you or someone else will be training employees. (For more comparisons between the Mac and PC worlds, see the Background box "Mac Versus PC.")

BACKGROUNDER

Mac Versus PC

If you've browsed some mail-order advertisements in PC-oriented magazines, you've probably noticed a price difference between Macs and PC-class hardware. This difference was dramatic when I wrote the first edition of this book; the gap is much smaller today, but it's still there. So why buy a Macintosh? Several reasons:

- *Ease of use* The Mac's *graphical user interface* — the on-screen menus and other devices you use to control your programs — makes the machine easier to learn and use. PCs can run a Mac-like graphical user interface called *Microsoft Windows,* but it isn't as polished or mature as the Mac's interface. The Mac was designed from the ground up to be a graphical computer; PCs weren't, and that shows. Macintosh hardware is generally easier to set up, too.
- *Larger software base* More programs are available that take advantage of the Mac's graphical personality than are available for Windows.
- *Superior video display options* It isn't surprising that a highly graphical computer would have superior video talents. Mac owners can choose from a large array of sophisticated video cards, including ones that display images with photographic realism and ones that can connect to video cassette recorders. Some such boards are available for PCs, but the selection is relatively small. What's more, there's no guarantee that a board will work with all PC programs. The Mac's standardized system software eliminates such compatibility concerns.
- *More built-in hardware* Macs include hardware that usually costs extra on PCs. This hardware makes it easier and less expensive to connect multiple add-ons and to interconnect Macs to form a network that lets you share expensive peripherals and information.
- *Sophisticated sound* Without third-party hardware, all most PCs can do is beep; by comparison, all Macs can play digitally recorded sounds. Most current Macs — including PowerBooks — can record digital sound, too. This not only means you can hear silly beep sounds when you make a blunder, you can also integrate sound into presentations and other documents you create. Products are available that even let you send recorded voice messages to other Macs on an office network. And AV Macs such as the Centris 660AV and Quadra 840AV can record and play audio with the fidelity of a compact disc. (Other Macs can, too, with third-party hardware.)

Hardware Decisions

You've thought about what you want to do with the Mac and you've determined which programs you want to use. You're ready to start shopping for hardware. That means addressing the six basic areas that differentiate each Mac model. I take a detailed look at most of these categories in later chapters; for now, here's an overview of what to think about before opening your checkbook. For an introduction to the ports and connectors found on the backs of most Macs, see Figure 1-1 "A Guide to Ports and Connectors."

A GUIDE TO PORTS AND CONNECTORS

- **ADB port:** For input devices; some Macs have two ADB ports, others have one.
- **Audio output jack:** For external speakers (for better sound quality).
- **External floppy drive port:** For floppy disk drive (not on all Macs).
- **Microphone jack:** For microphone for sound input (not on all Macs).
- **Modem port:** For telephone modem, printer.
- **Printer port:** For printer, LocalTalk network cabling.
- **SCSI port:** For (up to seven) external storage devices, scanners.
- **Video port:** For display monitor (not on all Macs).

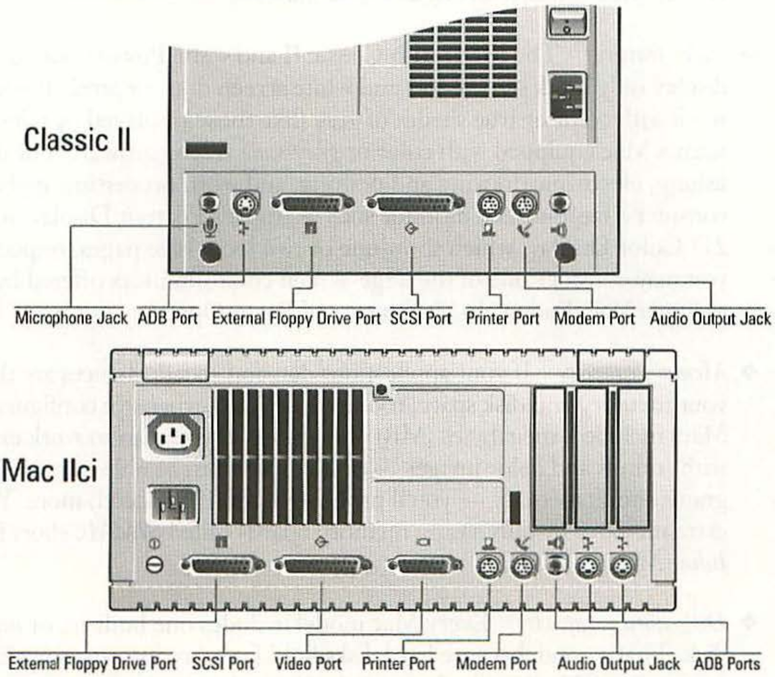


Figure 1-1: A Guide to Ports and Connectors

- *Size* If portability is important, you'll want to consider a Macintosh PowerBook or one of the members of Apple's *compact Mac* line — the Color Classic or Classic II. (The members of the Mac II family form the *modular* Mac line.) Of these, the PowerBooks are the only ones that run on batteries. Straddling the fence between the compact and modular Macs is the Macintosh LC III. The LC III isn't battery powered, but at only eight pounds (not including the display monitor), it's easy to move around. The LC520 is a one-piece LC III containing a color monitor and a pair of stereo speakers.

- *Speed* Any Mac can handle such tasks as simple word processing and filing, black-and-white drawing, telecommunications, light-duty desktop publishing and spreadsheet work, and creating and using HyperCard stacks. You'll probably want to seek out a faster Mac, however, for working with large databases or spreadsheets, large word processor documents with indexes and tables of contents, color illustrations or animations, or large desktop publications containing color.

- *Expandability* Most Macs contain internal *expansion slots* into which you can plug *cards* or *boards* that add to the machine's capabilities, but some machines provide more slots than others. *Accelerator boards* boost performance, for example, while *video boards* control monitors. Expansion slots are also an excellent defense against obsolescence. For example, an accelerator board can make an elderly Mac II nearly as fast as a Quadra.

- *Video features* The Macintosh Classic II and some PowerBook models can display only black screen dots and white screen dots, or *pixels*. If you want to work with color or true shades of gray (like those displayed by televisions), you'll want a Mac equipped with color or *gray-scale* video hardware. For desktop publishing, electronic drawing and drafting, and word processing applications, consider a large-screen monitor such as Apple's Portrait Display or Macintosh 21" Color Display, which show one or two letter-size pages, respectively. Or you may consider one of the large-screen color monitors offered by firms such as SuperMac, Radius, E-Machines, and RasterOps.

- *Memory capacity* If your applications demand speed, chances are they will devour memory and disk space, too. In their least-expensive configurations, many Macs include 4 megabytes (MB) of memory. If you plan to work extensively with sounds and color images — or if you want to be able to run several programs simultaneously — you'll probably want (if not need) more. You can add extra memory by purchasing memory boards called *SIMMs*, short for *Single Inline Memory Module*.

- *Disk-storage capacity* Every Mac model includes one built-in, or *internal*, hard disk. That's good, because hard disks hold far more information and transfer it far more quickly than do floppy disks. Today's complex programs require that speed and capacity. Most of the internal hard disks Apple ships can store 80MB, although Mac configurations with larger hard drives are also available. If (or more likely, when) you fill your hard drive, you can supplement it with an external hard disk. Prices for external hard drives have dropped sharply in recent years.

Macs to Go — the PowerBook Family

The PowerBook family falls into two broad categories — the all-in-one PowerBooks and the PowerBook Duo family.

All-in-one PowerBooks include the PowerBook 100, 145 and 145B, 160, 160c, 170, 180, and 180c. All current all-in-one PowerBooks contain an SCSI connector for attaching to external hard drives and other add-ons; an ADB port for a mouse or other input device; a modem port and a printer port; a SuperDrive floppy drive; and a video-output connector for attaching a display monitor. (The PowerBook 100, 140, and 170 models don't have the video-out connector, and the 100 lacks a floppy drive.)

QUICK TIPS

Visiting the Used Mac Lot

Used Macs have been showing up in classified ads and on college dorm bulletin boards for years. Should you consider one? That depends on the model.

Avoid the Mac Plus if your budget allows it. It's true that the Plus runs most of today's programs, including (if you're patient) System 7, the latest version of the Mac's system software. But the Plus's weakling power supply and lack of an expansion slot make obsolescence-shattering upgrades such as accelerator boards impractical and risky. What's more, as the Mac family as a whole gets faster, software developers are creating increasingly complex programs that often run sluggishly on the Plus.

As for the SE, its single expansion slot gives it a brighter future. Indeed, its expansion slot makes the SE less prone to obsolescence than the Mac Classic that replaced both it and the Plus. Unlike the Plus, the SE can reliably accommodate an accelerator board and an internal hard disk. It's also about 25 percent faster than the Plus, and about as fast as a Classic. The SE/30 is a great little Mac that's still well worth considering. (Indeed, the SE/30 has advantages over the Classic II.)

As for the modular Macs — ones that lack built-in monitors — all provide at least one expansion slot that can accommodate an accelerator board. But with new Mac prices as low as they are, you need to carefully evaluate whether an upgraded old machine is a better deal than a brand-new one. Chapter 31 lists some upgrade strategies for the members of the Mac family.

The PowerBook Duo models lack the SCSI connector, video-out jack, ADB port, and floppy drive, and they provide just one serial port, not two. When you need these ports, you attach a PowerBook Duo to one of several available *docking stations* (see Figure 1-2 "How the Duo System Fits Together"). One station — the Duo Dock — even contains expansion slots. The Duo system is designed to provide the best of both worlds — the portability of a PowerBook with the expansion flexibility of a desktop Mac. Whether it delivers on that goal is a question I address shortly.

Family similarities

All PowerBooks share numerous family traits, starting with a *liquid-crystal display* (LCD) screen. The PowerBook 100, 140, 145, and 160 models use a backlit *supertwist* display; so do the PowerBook Duo 210 and 230. High-end PowerBooks such as the 170, 180, and 180c, use an *active-matrix* display that is considerably brighter and easier to read. The PowerBook 165c provides a *passive-matrix* color display, while the 180c provides a beautiful active-matrix color display. (For a look at the differences between a passive- and active-matrix color display, see Figure 1-3 "How Color LCDs Work"). Passive-matrix displays are prone to a problem called *ghosting* or *shadowing*, in which windows and other items moved on the display leave a shadowy trail in their wake.

PowerBooks are likely to be used where there may not be roaming room for a mouse. For this reason, they contain a built-in trackball. Two crescent-shaped buttons surround the top and bottom of the trackball. The PowerBooks provide a large, flat area where you can rest your wrists as you type or use the trackball.

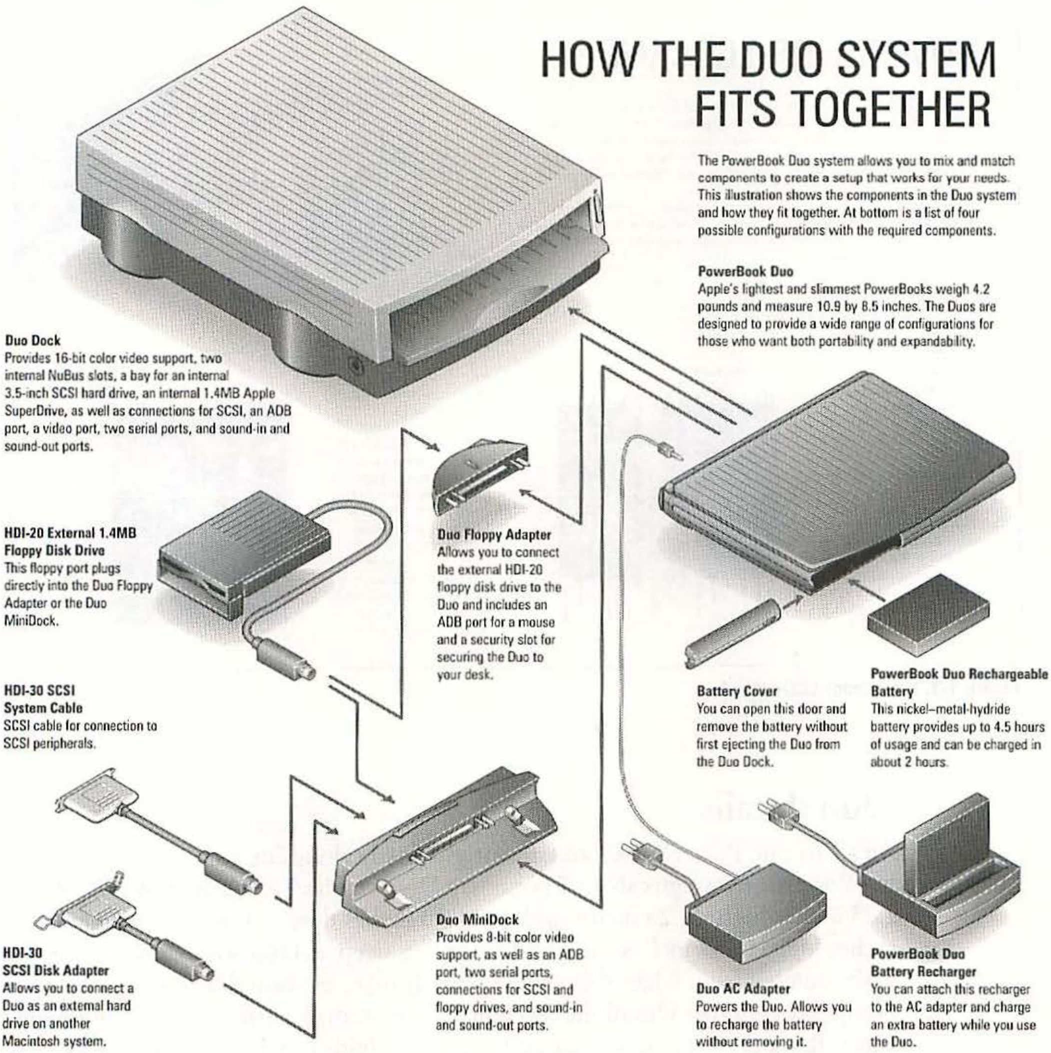
All PowerBooks except the PowerBook 100 and the discontinued 140 and 170 contain a built-in microphone. The PowerBook 140 and 170 can attach to the same type of external microphone used by desktop Macs. The PowerBook 100 does not support a microphone.

A PowerBook can run from a slide-in rechargeable battery or from an AC adapter, both of which are included with the machine. The battery is recharged when the computer is running from AC power. An external battery charger is also available that will charge up to two batteries at once. Battery life is determined by many factors — including the screen's brightness setting and the amount of hard and floppy disk activity — but as a general rule, you can expect roughly 2 to 4 hours of operating time between charges.

PowerBooks provide a variety of power-management features that let you extend the time between recharges. Chapter 24 describes how to take advantage of them.

HOW THE DUO SYSTEM FITS TOGETHER

The PowerBook Duo system allows you to mix and match components to create a setup that works for your needs. This illustration shows the components in the Duo system and how they fit together. At bottom is a list of four possible configurations with the required components.



PowerBook Duo
Apple's lightest and slimmest PowerBooks weigh 4.2 pounds and measure 10.9 by 8.5 inches. The Duos are designed to provide a wide range of configurations for those who want both portability and expandability.

Duo Dock
Provides 16-bit color video support, two internal NuBus slots, a bay for an internal 3.5-inch SCSI hard drive, an internal 1.4MB Apple SuperDrive, as well as connections for SCSI, an ADB port, a video port, two serial ports, and sound-in and sound-out ports.

HDI-20 External 1.4MB Floppy Disk Drive
This floppy port plugs directly into the Duo Floppy Adapter or the Duo MiniDock.

Duo Floppy Adapter
Allows you to connect the external HDI-20 floppy disk drive to the Duo and includes an ADB port for a mouse and a security slot for securing the Duo to your desk.

HDI-30 SCSI System Cable
SCSI cable for connection to SCSI peripherals.

Battery Cover
You can open this door and remove the battery without first ejecting the Duo from the Duo Dock.

PowerBook Duo Rechargeable Battery
This nickel–metal-hydride battery provides up to 4.5 hours of usage and can be charged in about 2 hours.

HDI-30 SCSI Disk Adapter
Allows you to connect a Duo as an external hard drive on another Macintosh system.

Duo MiniDock
Provides 8-bit color video support, as well as an ADB port, two serial ports, connections for SCSI and floppy drives, and sound-in and sound-out ports.

Duo AC Adapter
Powers the Duo. Allows you to recharge the battery without removing it.

PowerBook Duo Battery Recharger
You can attach this recharger to the AC adapter and charge an extra battery while you use the Duo.

Four Ways to Assemble a Duo System

MAXIMUM PORTABILITY

PowerBook Duo
A/C adapter
extra battery
battery recharger

PORTABILITY AND CONVENIENCE

PowerBook Duo
floppy adapter
floppy disk drive
mouse
A/C adapter
extra battery
battery recharger

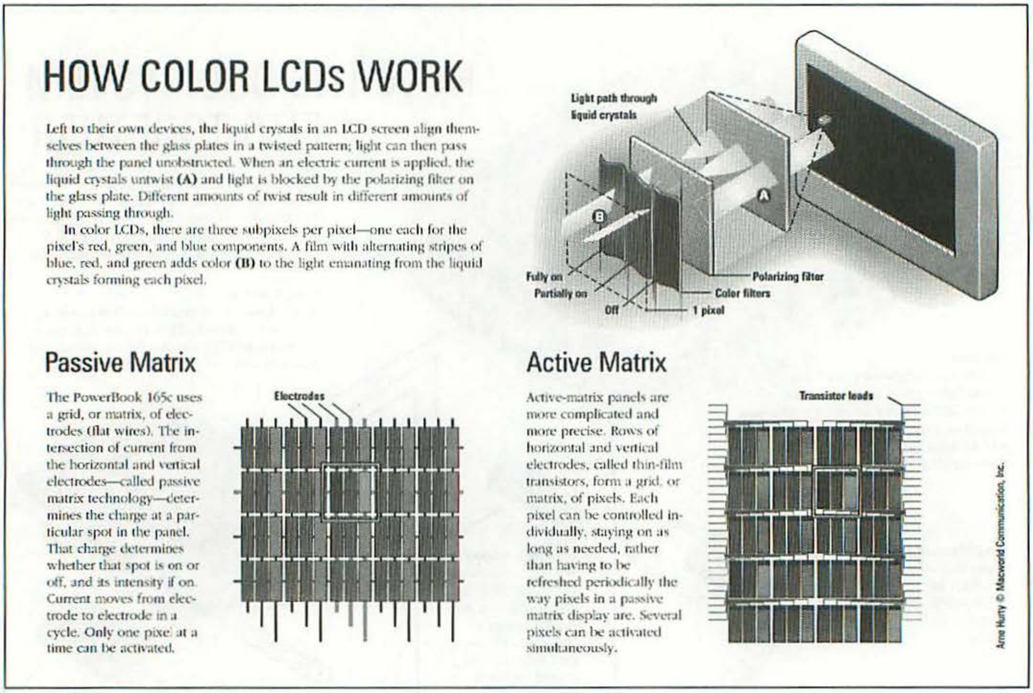
ENTRY-LEVEL DESKTOP

PowerBook Duo
Duo MiniDock
floppy disk drive
Macintosh Color Display
extended keyboard
mouse
A/C adapter, battery recharger
extra battery

FULL DESKTOP SYSTEM

PowerBook Duo
Duo Dock
Macintosh Color Display
extended keyboard
mouse
A/C adapter
extra battery
battery recharger

Figure 1-2: How the Duo System Fits Together



HOW COLOR LCDs WORK

Left to their own devices, the liquid crystals in an LCD screen align themselves between the glass plates in a twisted pattern; light can then pass through the panel unobstructed. When an electric current is applied, the liquid crystals untwist **(A)** and light is blocked by the polarizing filter on the glass plate. Different amounts of twist result in different amounts of light passing through.

In color LCDs, there are three subpixels per pixel—one each for the pixel's red, green, and blue components. A film with alternating stripes of blue, red, and green adds color **(B)** to the light emanating from the liquid crystals forming each pixel.

Passive Matrix

The PowerBook 165c uses a grid, or matrix, of electrodes (flat wires). The intersection of current from the horizontal and vertical electrodes—called passive matrix technology—determines the charge at a particular spot in the panel. That charge determines whether that spot is on or off, and its intensity if on. Current moves from electrode to electrode in a cycle. Only one pixel at a time can be activated.

Active Matrix

Active-matrix panels are more complicated and more precise. Rows of horizontal and vertical electrodes, called thin-film transistors, form a grid, or matrix, of pixels. Each pixel can be controlled individually, staying on as long as needed, rather than having to be refreshed periodically the way pixels in a passive matrix display are. Several pixels can be activated simultaneously.

Arne Hurty © Macworld Communication, Inc.

Figure 1-3: How Color LCDs Work

Duo details

An all-in-one PowerBook looks downright portly alongside a PowerBook Duo. A big PowerBook weighs about 7 pounds; a Duo weighs 4.25. A big PowerBook is 2.25 inches high, 11.25 inches wide, and 9.3 inches deep; a PowerBook Duo is 1.42 inches high, 10.87 inches wide, and 8.5 inches deep. A Duo is also less angular, with rounded front edges that should make it more comfortable to carry. Rubber bumpers along the sides of the machine help cushion it against bumps. Inside the PowerBook Duo, a magnesium subframe adds rigidity and plays an important role in establishing a firm connection between the computer and a docking station.

The Duo trackball and keyboard are even smaller than those of a big PowerBook — these are not computers for the ham-handed. The Duo's marble-sized trackball measures just 19mm in diameter; big PowerBooks have a 31mm trackball. Pointer movement is surprisingly smooth, though, thanks to three tiny, synthetic ruby bearings that support the trackball. The trackball's tininess keeps it from protruding above the Duo's palm rest; the two trackball buttons are also recessed. This makes the whole affair less obtrusive and allows for a thinner lid, but some may find it makes pointing and clicking more cumbersome.

The Duo keyboard layout is identical to larger PowerBooks', although the keyboard itself is different. The spacing between keys is slightly tighter, making the keyboard a bit more cramped. Also, the *key travel* — the distance a key moves down when pressed — is shorter: about 2.5 millimeters versus 3mm. A half a millimeter isn't much, but it makes the keyboard feel a bit more responsive.

Different batteries

Instead of the nickel-cadmium (NiCad) batteries used in most big PowerBooks, the Duos use a nickel metal-hydride (NiHy) battery that provides more power in a smaller package. NiHy batteries can also charge more quickly — in about an hour and a half, versus 4–5 hours for a PowerBook 170's battery. NiHy batteries are also considered less toxic to the environment; cadmium has been classified as a toxic material by the EPA, but to date at least, metal hydride has not.

Unlike all big PowerBooks except the 100, a PowerBook Duo's battery bay is on the front edge of the machine, not on the side. This location makes it possible to change and recharge batteries while the PowerBook Duo is in the Duo Dock.

Preparing for docking

Before docking a PowerBook Duo, you must choose its Shut Down command; if you insert a sleeping Duo, the dock ejects it and a dialog box appears on the Duo's screen. (Of course, you have to open the lid to read it.) After shutting down, you open the PowerBook Duo's rear door, exposing a 152-pin, palladium-plated expansion connector. The expansion connector is a 32-bit processor-direct slot that allows access to every signal line on the 68030 processor.

After opening the expansion door, slide the Duo into the Duo Dock's slot and push gently. As the PowerBook approaches the rear of the slot, two steel alignment pins in the dock meet corresponding holes in the PowerBook's internal magnesium frame, ensuring that the expansion connector mates accurately with its counterpart in the Duo Dock. When the PowerBook Duo is five millimeters away from its destination, it trips an optical sensor, activating two motorized hooks that grab the PowerBook's magnesium frame and draw the computer home with a satisfying *thunk.* All this happens in about the time it takes to insert a floppy disk in a disk drive.

What a difference a dock makes

Once docked, the 4-pound PowerBook has two serial ports, an Apple Desktop Bus port, a SCSI port, an external monitor port, a larger speaker, and two NuBus slots. The monitor port uses the Duo's video circuitry to display up to 256 colors on monitors as large as 16 inches. The Duo Dock contains a socket for a video expansion card that allows for over 32,000 colors on monitors as large as 16 inches. The dock's case can support a monitor that weighs up to 50 pounds. The Duo Dock also has room for a second hard disk.

The Duo Dock contains a lock-and-key mechanism that lets you lock the Duo and prevent someone from walking away with it. You can also lock a vacant dock to prevent someone else from using it. The Duo Dock includes a standard ADB mouse, but does not include a keyboard.

The biggest compromise in the Duo Dock concerns the NuBus slots. In order to keep the dock's size down, Apple placed the slots underneath the dock's PowerBook bay. To access the slots, you must remove the upper case lid, disconnect the power supply, remove two screws, and then remove and invert the Duo Dock's insides. Also, because NuBus cards lie parallel to your desktop, rather than at right angles to it as they are in most other Macs, you must remove the top NuBus card in order to access the bottom card. If you plan to swap cards extensively, these gymnastics may become bothersome.

Preparing for departure

When it's time to go, push the Duo Dock's Eject button. If any unsaved documents are open, you're asked if you want to save them. That accomplished, the PowerBook Duo shuts down and the Duo Dock ejects it. (You can also use the key to manually eject the PowerBook should a power failure occur.)

Some docking stations have been available in the DOS PC world, but they lack the polish of the Duo system. None provide a motorized insert-and-eject mechanism, for example, and instead rely on strictly mechanical docking schemes that force you to push with some oomph to dock the computer.

But the Duo Dock's motorized mechanism does more than eliminate having to push. Because it's tied to the PowerBook's system software, it can inform the PowerBook that you've pushed the Eject button, giving the PowerBook a chance to ask if you want to save unsaved documents. Other notebook computers and docking stations lack this intelligence. You can, for example, undock an MS-DOS portable even if unsaved documents are open. If you do, you lose work.

The underlying glue that ties together the Duo and a docking station is a collection of hardware and software Apple calls PowerLatch. In general, PowerLatch allows for easier transitions between portable and desktop computing. It's what keeps you from losing work when you press the Duo Dock's Eject button. It also automatically configures the PowerBook for docked operation, activating the dock's math chip and video memory expansions if they're installed, and temporarily disabling any power-saving options you activated.

Docking on the road

When your Duo needs ports on the road, there's the 1.5-pound Duo MiniDock, which snaps onto the back of the PowerBook Duo and adds a standard complement of ports, including ones for an external floppy drive and color monitor. As with most big PowerBooks, you can specify that an external monitor be treated as an extension of the PowerBook Duo's desktop or that it mirror the contents of the PowerBook display. The latter option is handy for presentations.

If you need only an external floppy drive, there's the Duo Floppy Adapter, which also provides an ADB port for a mouse and keyboard. The Duo system's PowerLatch technology also streamlines connections to the portable docking stations. For example, if you connect either dock to a sleeping PowerBook Duo, you can wake up the computer and immediately use an external floppy drive: You don't have to waste battery power by restarting.

Apple recommends that you disconnect any docking station before transporting the PowerBook Duo to avoid putting undue stress on the expansion connectors and the hooks on the docking station.

Is a Duo for you?

Will the PowerBook Duo system give you the best of both worlds, or should you combine an all-in-one PowerBook with a desktop Mac?

Start by discounting the notion that a Duo system will save you a lot money compared to buying a separate desktop Mac and PowerBook. You will save some money, but not all that much, especially when you consider that, in the end, you will still have just one computer.

The Duo system becomes particularly expensive if you want NuBus slots at the office *and* a full array of ports when you're on the road. For example, if you frequently need to connect to an external monitor to give presentations when traveling, you need to buy a MiniDock in addition to the Duo Dock you already purchased. Throw in more money if you want a portable floppy drive. You don't have to buy a Duo Dock, but if you buy just the MiniDock, you forgo NuBus slots and all the other expansion opportunities the Duo Dock provides.

In the end, the Duo system is more about convenience than it is about saving money. The idea of working with just one hard disk whether or not you're traveling is very appealing. (Of course, it also makes a faithfully followed backup routine essential, since your sole hard drive is subject to the rigors of the road.)

Which Route for You?

Before you buy a Mac, you need to weigh the differences between each model and determine which features are most important to you. This helps you get the machine best suited to your present and future situation.

Aside from actually writing out the check, this is one of the hardest steps in the purchasing process. It's at this juncture that you realize just how many ways exist

QUICK TIPS

Macintosh Versus Macintosh Performa: What's the Difference?

You're at the local Sears outlet, admiring the shiny new washing machines and the Craftsman air compressors. You round a corner and are greeted by...a Macintosh?

No, a Macintosh Performa. The Performa family is a special line within the Macintosh family, intended for sales through department stores, electronics superstores, and office-supply outlets — not the usual places you expect to see Macs on display.

All of the Performa models are based on "regular" Macintoshes. The Performa 200 is the same basic computer as the Mac Classic II, for example, while the Performa 405, 430, and 450 are based on the Mac LC III.

So what makes a Performa different?

- *What you get in the box* As mentioned earlier in this chapter, most Macs don't included a keyboard — you choose the one you want when you buy the machine. Performas don't give you this freedom of choice — they include a keyboard. The Performa 200 and 400 series include the standard Apple Keyboard II (the one without function keys). The Performa 600 models include the Apple Extended Keyboard II (the big honker with all the function and navigation keys). The Performa 400 and 600 models also include a fax/data modem (discussed in Chapter 17) as well as a video display. (The Performa 200's monitor is built into the case.)
- *What you get on the hard disk* The Performa machines are designed to be plugged in, turned on, and used. A Performa comes with a selection of application software already installed. (The specific programs vary.) Performas also include Apple's At Ease program-management utility, which provides a simplified method of starting programs. (At Ease is discussed in Chapter 23.)

Should you buy a Performa or assemble a Mac system yourself? That depends on your needs and your shopping skills. If you prefer the simplicity of the everything-in-one-box approach, consider the Performa. If you'd rather assemble a system and software library yourself, consider a "regular" Mac.

If you bought an all-in-one stereo system because you dreaded shopping for separating components and then figuring out how to connect them, you're probably a Performa person. On the other hand, if you spent weeks reading lab reports, conducting listening tests, and comparing specifications, you'd probably be happier assembling your own Mac components. The nice thing about the Performa line is that it gives Mac consumers this choice.

for you to reach your hardware goals. The Quick Tips box "Advice for Mac Shoppers" presents a few buying tips to steer you in the right direction.

One more piece of advice: Don't put off a purchase in the hopes that some future Mac will offer dramatic new features at half the price. If you really need a machine now, buy a machine now. It will be supplanted by faster machines with new fea-

Advice for Mac Shoppers

In this box, I present some pointers to consider when shopping for a Mac system.

- Buy the fastest Mac you can afford, even if your present needs are simple. You'll enjoy top-notch performance, and your hardware will be better suited to running System 7 and the programs that exploit its talents. At the very least, your system will retain its value better should you decide to sell it.
- Don't be afraid to mix and match components. There may be a certain comfort that comes with buying all your components from one company, but that comfort will cost you. You can often save money by buying non-Apple hard disks, printers, modems, network connectors, and memory upgrades. And many third-party hard disks and laser printers are faster than Apple's. On the other hand, many third-party products lack the "plug and play" setup convenience of Apple's add-ons, which are designed to mesh tightly with the rest of your Mac system. Also, some companies strip away features to arrive at a lower list price: Some low-cost laser printers, for example, require you to purchase extra memory if you want to print on legal-sized (8 ½ by 14-inch) paper. The bottom line: You can save money and often get superior hardware by buying third-party products, but assess your needs and compare features carefully.
- To save even more, buy your third-party gear through the mail. Items available through most mail-order firms include printers, hard disks, external floppy drives, modems, scanners, video monitors, network cables, software, and memory upgrades. (The latter require careful hands but no special tools to install in a modular Mac; for compact Macs, you're better off having a dealer install extra memory.) The drawbacks: You're likely to suffer delays if a defective component needs to be returned, and you won't be able to turn to one source for technical assistance. Some consumers have also been burned when the manufacturer of their mail-order hard disks filed for bankruptcy after charging their credit cards for goods never delivered. *Caveat emptor:* Ask fellow Mac users to recommend prompt, reliable mail-order houses that they've dealt with.
- Join a user group. Asking other people about products and places to buy them is a good idea no matter how much experience you have. Call 800-538-9696, extension 500, to find the group closest to you. As your experience grows, you may evolve from a question asker to a question answerer, helping newcomers treading the same path you did.

tures, but if you buy a Mac with expansion slots, chances are you'll be able to buy boards that boost performance or add those new features to your existing machine.

More to the point, if you wait to buy a Mac, you miss out on the productivity-boosting benefits one can provide. It's like waiting to buy a car in the hopes that next year's model will be cheaper or get better gas mileage. Maybe it will, maybe it won't, but one thing is certain: You will do a lot of walking in the meantime.

Understanding the Mac's Interface

The Mac is an easy-to-use machine, but it's also powerful and complex. And because it's so easy to learn basic Mac tasks, many people never venture into the nooks and crannies that help make the machine so powerful.

Before I look at ways to put the Mac to work, I'm going to guide you into some of those nooks and crannies. This section isn't a step-by-step tutorial on Mac basics: The Mac's manuals contain detailed tutorials, and I'd be wasting space by repeating them here. Instead, this section is a whirlwind tour of the Mac's interface and of basic Mac operating techniques. If you're a Mac veteran, you probably talk about these things in your sleep. If you're new to the Mac or you use it only occasionally, the information in this chapter will form the foundation that I build on in the rest of this book.

The Mac's way of doing things

The cornerstones of the Mac's easy operating style are its graphical user interface and its mouse. Many computers require you to memorize and type cryptic commands or choose them from option lists whose workings vary from program to program; not the Mac. You control the Mac by using the mouse to control the position of an on-screen arrow, called the *pointer*. By rolling the mouse and pointing to the elements you see on the screen and then *clicking* the button on top of the mouse, you can issue commands, work with disks, and much more.

Figure 1-4 "Face to Interface" shows the key elements of the Mac's user interface. Your Mac manual describes them in detail, so I just summarize them here.

- *The desktop* is your electronic work surface, upon which rest *icons*, pictorial representations of objects such as disks, or of functions such as the Trash can.

- *The menu bar* contains *menu titles*. When you point to a menu title and then press and hold the mouse button, a list of *commands* called a *menu* appears. To choose a command, move the mouse pointer while pressing the mouse button

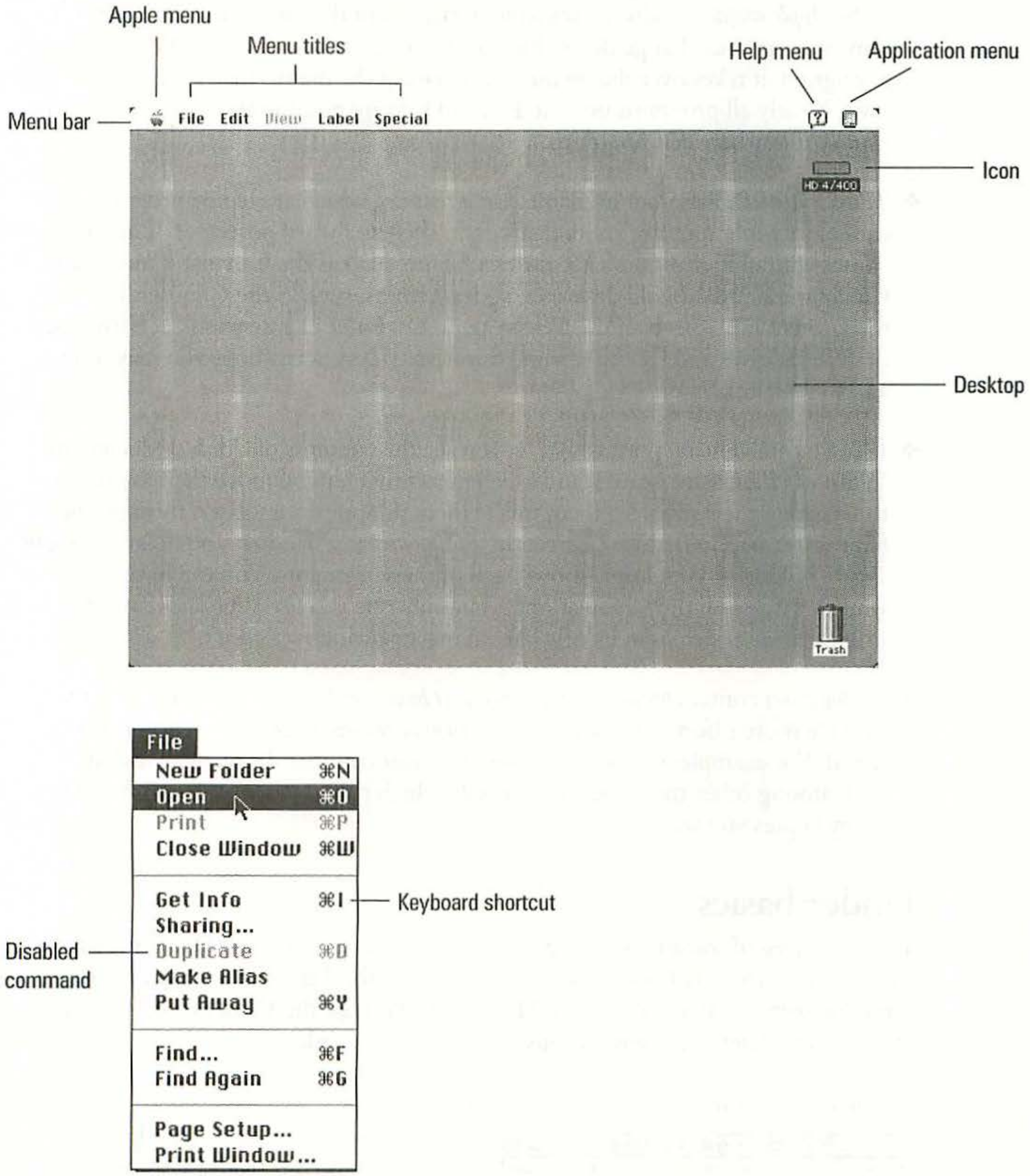


Figure 1-4: Face to Interface The Mac's user interface relies on these standard elements.

until the command is *highlighted,* and then release the button. The leftmost menu is the *Apple menu;* it's always available regardless of the program you're using. The remaining menus change depending on the program you're using. When you start a program, it takes over the menu bar, replacing the menus that were there with its own. Nearly all programs provide File and Edit menus, but the menus' commands usually differ between programs.

- *The Apple menu* lists your available *desk accessories,* which are handy programs you can select while running another program such as a word processor. The Mac comes with numerous desk accessories. Some, such as the Calculator and Alarm Clock, mimic real-world desk accessories. Others, such as the Chooser, let you manage certain aspects of the Mac's operation. Later chapters look at both types of desk accessories and spotlight some third-party desk accessories you may want to add to your collection.

- *Windows* are viewing portals that let you see the contents of a disk or document. Windows themselves have standard elements that let you move them on the desktop, change their size, *close* them (make them disappear), and *scroll* through them (view information that isn't currently visible within a window's boundaries). Figure 1-5 "Looking at Windows" shows each of these elements. You can have many windows open on the screen at once, but only one is *active.* The active window has thin horizontal stripes in its title bar; an inactive window doesn't.

- *Dialog boxes* contain *buttons, check boxes, text boxes,* and other elements that let you provide more information and select various options after you've chosen a command. For example, when you choose the Print command, you get a dialog box that, among other things, lets you specify which pages you want to print and how many copies you want.

Finder basics

The first piece of software you encounter when you start up your Mac is the *Finder.* The Finder is the link between you and the rest of the Mac's *system software,* the fundamental software that enables the Mac to run. You use the Finder to start or *launch* programs, to delete files, and to copy, eject, and erase disks.

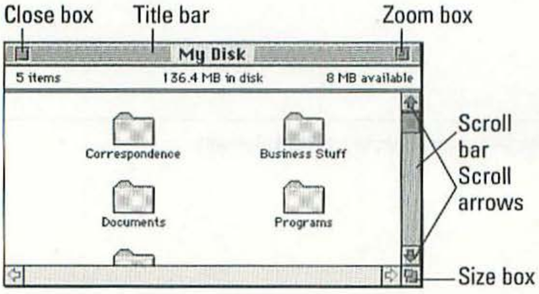


Figure 1-5: Looking at Windows
Windows provide standard components, shown here, that let you move, close, scroll through, and resize them. These components operate similarly in all Mac programs, so once you've learned how to work with a window such as this Finder directory window, you can work with windows in any program.

The Finder also provides disk-management conveniences — the Get Info command for attaching descriptive text to files, for example — and it lets you organize a disk's contents by creating folders, and moving documents, programs, or other folders into them. The Finder's Print Window command (in the File menu) also lets you create print-outs that show what's on a disk or in a certain folder.

Clipboard 101

The Mac's *Clipboard* enables you to move information between programs, and has always been one of the Mac's greatest strengths. Thanks to the Cut, Copy, and Paste commands that virtually all Mac programs provide, you can include graphics in a word processor document — or paragraphs of text in a drawing.

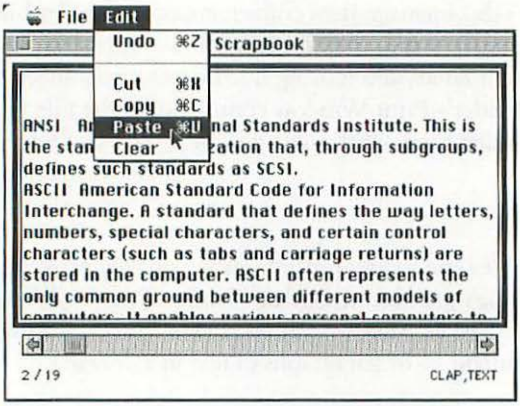
Copying, pasting, and compound documents

Apple's ads often showcase this ability by depicting a fancy business report with a chart shoehorned into it. Combining text and graphics to create what are often called *compound documents* is certainly one way to put the Clipboard to work. But don't ignore its more mundane uses. Recycle text or part of a graphic by copying it from an older version of a document. If you're always typing a finger-twisting scientific term, copy it to the Clipboard and paste it each time it's needed. To remind yourself of what's in a word processor document, copy the first few lines of it and paste them into the Finder's Get Info window for that document — more about Get Info shortly.

If you use the Calculator desk accessory (DA, for short), you can copy the result of a calculation and then paste it into a document; simply choose Copy after performing the calculation. You can also paste numbers or math symbols from the Clipboard to the Calculator. You can even see the Calculator's keys flash to reflect what you've pasted. (You'll also hear a lot of error beeps if you paste characters that don't correspond to keys on the Calculator.) And here's a handy way to "stamp" a document with the time you started working on it: Select the Alarm Clock DA from the Apple menu, choose Copy to put the current time and date on the Clipboard, and then paste it at the beginning of your document.

Saving the Clipboard in the Scrapbook

The Clipboard's contents vanish when the Mac is switched off, but you can save them using the Scrapbook DA — just open the Scrapbook and choose Paste. Doing so adds a new "page" containing the Clipboard's contents to the Scrapbook (see Figure 1-6 "Compiling a Scrapbook"). To retrieve an item from the Scrapbook, use the scroll bar to get to the desired page, and then choose Copy from the Edit menu (or Cut to remove the item from the Scrapbook).



ANSI Ar nal Standards Institute. This is
the stan zation that, through subgroups,
defines such standards as SCSI.
ASCII American Standard Code for Information
Interchange. A standard that defines the way letters,
numbers, special characters, and certain control
characters (such as tabs and carriage returns) are
stored in the computer. ASCII often represents the
only common ground between different models of

Figure 1-6: Compiling a Scrapbook The Clipboard's contents vanish when the Mac is switched off, but you can save them by opening the Scrapbook (choose its name from the Apple menu) and choosing Paste. To retrieve an item from the Scrapbook, use the scroll bar to get to the desired page, and then choose Copy from the Edit menu.

The Scrapbook's contents are stored in a file called Scrapbook File, located in the System Folder. If you want to move your Scrapbook to a different Mac, copy the Scrapbook File to a floppy disk and then copy it to the System Folder on the second Mac. Note that you'll replace the existing Scrapbook on the second Mac; you may want to stash the existing one in a different folder first or just rename it.

If you use the Scrapbook extensively, consider one of the more powerful Scrapbook alternatives such as Portfolio Systems' SmartScrap. SmartScrap supports multiple Scrapbook files, enabling you to create separate ones for, say, text and graphics. It also provides a table of contents feature that shows lots of pages reduced to fit within a window and enables you to jump to a specific page in a flash.

What's Your Version Number?

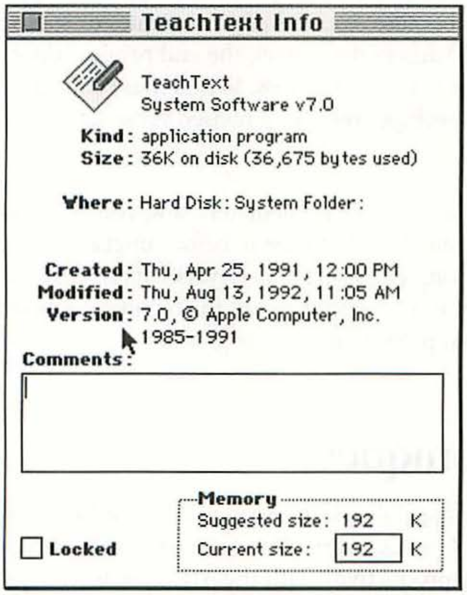
That isn't a line from a Silicon Valley singles bar. Software evolves over time — bugs are fixed, features are added, performance is improved — and *version numbers* indicate just how far along the evolutionary timeline a particular program is.

There are a few good reasons to know how to determine version numbers. When you call a dealer or software firm for technical help, you'll probably be asked which version of the Mac's system software you're using. When you buy a program, you'll want to be sure you're buying the latest version. And you'll want to verify its compatibility with the version of the Mac's system software you use.

Determining version numbers

One way to determine a version number is to use the *About command,* which always appears first in the Apple menu. To learn the version number of your Mac's system software, for example, choose the About This Macintosh command. (In System 6, the command reads About the Finder.) To learn the version number of an application program, start that program and choose its About command.

Another way to determine a program's version number is to use the Finder's Get Info command: Select the program's icon and choose Get Info from the File menu. The file's version number appears in the Get Info window (see Figure 1-7 "What's Your Version?").



TeachText Info

TeachText
System Software v7.0

Kind: application program
Size: 36K on disk (36,675 bytes used)

Where: Hard Disk: System Folder:

Created: Thu, Apr 25, 1991, 12:00 PM
Modified: Thu, Aug 13, 1992, 11:05 AM
Version: 7.0, © Apple Computer, Inc. 1985-1991

Comments:

Memory
Suggested size: 192 K
Current size: 192 K

☐ **Locked**

Figure 1-7: What's Your Version? Choosing the Finder's Get Info command displays a window containing statistics about the selected application or document, a check box for locking the file to prevent accidental modification or deletion, and a text box that can contain several paragraphs of descriptive text. The Get Info window for an application program also lists the program's memory requirements.

The Get Info command also works for documents you create. A document file doesn't display a version number in the Get Info window, but you can use the text box at the bottom of the window to type descriptive information about the file (or paste a few sentences from it, as mentioned earlier).

Version numbering schemes

Among manufacturers, there is no standard for version numbering, though there is a general rule. When a product is significantly improved, the number before the decimal point increases. When the revision fixes bugs or has only minor improvements, the number after the decimal goes up. A product label may say "requires System version 7.x." In this case, you need any version that begins with 7. A manufacturer may also state that its product requires "System version 7.0 or later": In other words, a version with a higher number will probably also work.

I qualified that last sentence with "probably" because system software enhancements sometimes cause a program that worked fine under an earlier system version to fail. Sometimes this happens because developers bend Apple's programming rules. Other times, it happens because Apple changes the rules or spells them out ambiguously to begin with. Whatever the reason, the end result is the same: A program that used to run reliably no longer does. When these software growing pains surface, the program's developer releases a revised version that is compatible with the new system software.

But the new version may not be available immediately, and you don't want to be out of operation in the meantime. For that reason, before upgrading your Mac's system software to a new version, it's a good idea to verify its compatibility with the programs you use. Go straight to the source — call the technical support hotlines operated by the companies that published your programs.

Basic Navigation Techniques

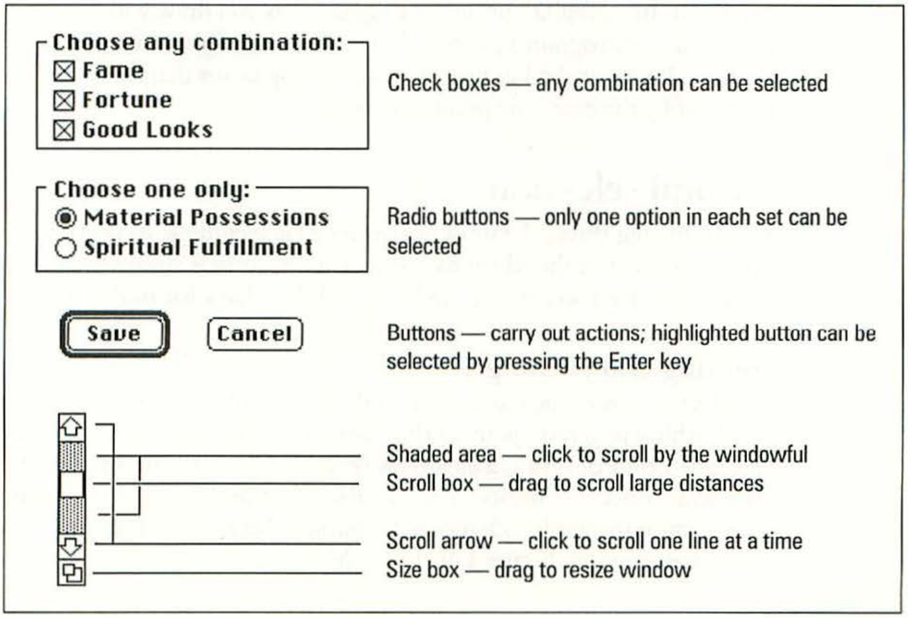
An old bicyclists' maxim says that the easiest way to make your bike five pounds lighter is to lose five pounds. There's a variation of that truism for the Macintosh: The easiest way to boost your productivity with the Mac is to learn how to control it efficiently. Today's fast Macs and high-performance add-ons are great, but you won't get the most out of them until you master all the navigation options the Mac and its programs provide.

The role of the rodent

You may think that Mac navigation concepts can be summed up in one word — mouse. The mouse doesn't have exclusive domain over Mac manipulation, but there's no denying the rodent's role as the primary link between you and your Mac. That's why navigational expertise is built on three basics — the click, the double-click, and the drag.

Clicking — pressing the mouse's button once — is your way of telling the Mac, "Here's where I want to work." *Here* is where the mouse's on-screen pointer is. In the Finder, pointing to an icon and clicking tells the Mac to *select* the icon — to highlight it for a subsequent action. In a word processor, clicking produces a blinking *insertion point* where you've situated the pointer. In a dialog box, clicking a button performs an action, such as OKing or canceling your choices; clicking on a radio button or a check box selects an option. Most Macintosh programs follows these basic rules. Figure 1-8 "Buttons and Bars" shows the differences between check boxes and radio buttons and spotlights some other components of the Mac interface.

Double-clicking — pressing the mouse button twice in rapid succession — creates a kind of super click, a cut above a single click in the mouse-maneuvering hierarchy. Double-clicking an icon in the Finder is the same as clicking it once, and then



Choose any combination:
☒ Fame
☒ Fortune
☒ Good Looks

Choose one only:
● Material Possessions
○ Spiritual Fulfillment

Check boxes — any combination can be selected

Radio buttons — only one option in each set can be selected

Buttons — carry out actions; highlighted button can be selected by pressing the Enter key

Shaded area — click to scroll by the windowful
Scroll box — drag to scroll large distances

Scroll arrow — click to scroll one line at a time
Size box — drag to resize window

Figure 1-8: Buttons and Bars A guided tour of the interface elements you're likely to encounter in dialog boxes.

choosing Open from the File menu. When you're editing text, whether in a word processor, a spreadsheet, or the text-entry portions of a dialog box, double-clicking while the pointer is on a word selects that word: It's faster than manually dragging the pointer across the entire word.

Advanced mouse maneuvers

In programs that provide *palettes* — rows of icons that control program functions — double-clicking an icon often performs an action that's an extended version of the icon's normal purpose. In many graphics programs, for example, double-clicking the eraser icon clears the entire drawing window. In Claris' MacDraw Pro, double-click a tool and you can draw one shape after another without having to reselect the tool each time. In Claris' FileMaker Pro database manager, double-click a field name to modify it. In QuarkXPress, double-click a text block or graphic to display the Modify dialog box. The list goes on — and you'll find it in your manuals.

(Incidentally, if you find that the Mac isn't treating two clicks as a double-click, you may not be clicking quickly enough. Either speed up your clicking or use the Mouse control panel to tell the Mac to give you more time to double-click. Your Mac manual describes the latter option in detail.)

Dragging is the process of moving the mouse while holding down its button. You move windows by dragging their title bars. In the Finder, you move icons by dragging them. In a graphics program, dragging lets you draw with the tool that's selected in the program's palette. You can also reposition items by selecting them, and then dragging. And in programs and dialog boxes that let you edit text, you can select text by dragging the pointer across it.

Natural selection

Next to the big three, the most important Mac technique to perfect is *selecting*. A primary precept of the Macintosh says that selection is always the first step in an action: You select something, and then tell the Mac what to do with it.

Pointing and clicking

To select an object such as an icon in the Finder or a graphic element in a drawing or publishing program, point at the object and click — once. Don't be what my colleague Lon Poole calls a *hapless double-clicker* — someone who habitually clicks twice when once will suffice. You can also select multiple objects by enclosing them in a selection rectangle, often called a *marquee* because its dotted lines flow like a movie marquee (see Figure 1-9 "In the Marquee").

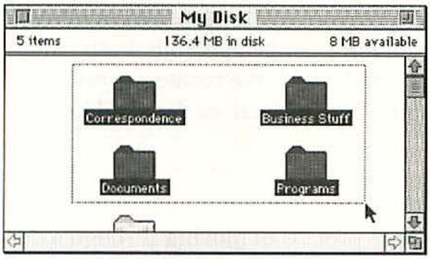


Figure 1-9: In the Marquee In the Finder and in most desktop publishing and drawing programs, you can select multiple objects by enclosing them within a marquee.

To draw a marquee, position the pointer at one corner of the area you want to enclose, hold down the mouse button and drag to the opposite corner; releasing the button highlights all selected objects. The technique works differently in certain applications: In some, like the Finder, you need only touch an object with the marquee, but with others, the whole object must be enclosed.

You can combine the two main text-selection moves — selecting a word by double-clicking it and selecting a range of text by dragging the pointer across it. Just double-click to select a single word, and then without releasing the button after the second click, drag to select additional text, one word at a time. And if you select text as a prelude to replacing it, don't press Backspace or Delete before typing the new text. Just start typing; the first key you press clears the selected text.

Faster selections with shift-clicking

When you need to alter a lengthy passage of text, dragging through it all can be a drag in itself. A better solution is to use the *Shift-click* technique. Locate the beginning of the passage you're changing and click to the left of its first character to create a blinking insertion point. Next, locate the end of the section, and then hold down the Shift key and click to the right of the last character or, to include a Return character, at the beginning of the next line.

Shift-clicking also lets you extend a selection — that is, add additional items to an existing selection. If you realize you didn't select enough text, just hold down the Shift key again and click at the appropriate place. To select a slew of icons, you may combine the marquee and Shift-clicking techniques: Select icons adjacent to each other by enclosing them in a marquee, and then add ones that are scattered throughout the window by Shift-clicking on them. These same techniques also apply in most graphics and desktop publishing programs, as well as in database managers that let you create customized forms.

The Shift key takes on an additional function in drawing and publishing programs: It lets you *constrain* a drawing action. For example, pressing Shift while drawing with an oval tool produces a perfect circle; with the rectangle tool, you get a perfect square; with a line tool, you get horizontal, vertical, or diagonal lines.

Scrolling along

As I mentioned earlier, scrolling is the process of moving through a document or disk window so that you can see things that aren't visible within the window's size. If you imagine your document as a scroll and the window as a frame that lets you see part of it, you can understand where the term comes from.

Scrolling is such a pervasive activity, you should be aware of the three ways to do it. You can scroll in small increments (usually one line at a time) by clicking the up- or down-arrow at the ends of the scroll bar; hold down the mouse button to scroll continuously. Click the shaded area above and below the scroll box to scroll by the windowful, again holding down the mouse button to do so continuously. To scroll large distances in a single bound, drag the scroll box itself (for example, to reach the end of a document, drag the box to the bottom of the scroll bar). With the third approach, an outline of the scroll box follows the pointer as you drag; when the outline is where you want it, release the mouse button and the window scrolls.

But for searching through a lengthy word processor document, scrolling can be cumbersome and time consuming. If your word processor provides one, use the Go To command to jump to a specific page. If you don't know the general vicinity of the text you're looking for, the Find command is a better option: If possible, select an unusual word or phrase that appears only in the section you're looking for and the Mac will take you there swiftly with no stops in between.

The keys to navigation

In the navigational realm, the Macintosh keyboard used to be considered a second-class citizen. Apple's philosophy held that keys should be used only for text entry, because keyboard commands were considered intimidating and far less intuitive than mouse movements.

That was true to an extent, but wordsmiths and data-entry artisans soon began moaning about how constant jumping between keyboard and mouse slowed them down. Fortunately, Apple listened. The Mac Plus keyboard debuted with *direction keys,* which let you move the insertion point, and from then on the Mac's keyboard maneuvering aids have steadily improved.

The power of the ⌘ key

One keyboard control the Mac has always provided is the *⌘-key shortcut*, which involves pressing the ⌘ key along with a letter or number key. ⌘-key sequences let you execute commands from the keyboard so you can bypass the mouse. These shortcuts are especially useful in text-oriented programs like word processors, because they let you issue commands without moving a hand from the keyboard.

A program's designers decide which commands will have ⌘-key shortcuts and list them alongside the corresponding menu commands. The most common are ⌘-Q to quit an application, ⌘-O to open a document that you've previously saved, ⌘-S to save your work on disk, and ⌘-P to print. Most programs with Font or Style menus offer ⌘-key shortcuts that let you access other type styles, such as italic or bold. Most word processors also use ⌘-F to summon the Find command. But you shouldn't assume that all applications use the same shortcuts: It's best to explore each application's menus to find out for sure.

The best navigation habit you can develop is to periodically press ⌘-S to save your document as you work. Do it every few minutes — every time you pause for inspiration or get a phone call — and you won't lose much if a power failure or system error occurs. (Incidentally, don't be alarmed if a program doesn't have a Save command: Many programs, including HyperCard and most database managers, save automatically as you work.)

Keyboard control in dialog boxes

Commands like Open and Find always lead to dialog boxes, which have keyboard-control options of their own. In an Open dialog box you can locate a specific document or folder by typing the first character of its name. If more than one document or folder starts with the same character, type a few characters. (Unless you type them in fairly rapid succession, though, the Mac assumes each keystroke is the first character in a different name.)

Many people exploit this trick by preceding the names of often-used folders or documents with a number or punctuation character such as an exclamation mark (!). That way, they can jump to a particular item by typing a single number or character. Any character will work except for the colon (:), which is the one character the Mac doesn't let you use in a document or folder name.

If your keyboard has direction keys, you can use them to scroll through the list of document and folder names. To open a document or a folder, select its name and press Return. To close a folder and move up one level in the folder hierarchy, press the ⌘-key along with the up-arrow key. To cancel the dialog box, press ⌘-period (.). Some people find these key sequences more cumbersome than using the mouse, but keyboard aficionados swear by them. It's another example of how the Mac lets you choose the navigation style that suits you.

The Tab key in dialog boxes

Speaking of dialog boxes, you can use the Tab key to move between their text-entry boxes (see Figure 1-10 "Dialog Box Shortcuts"). For example, to perform a search-and-replace in Microsoft Word, press ⌘-H to summon the Replace dialog box, type the text you want located, press Tab to jump to the Replace With box, and type the new text. When you're finished, there's still no need to reach for the mouse.

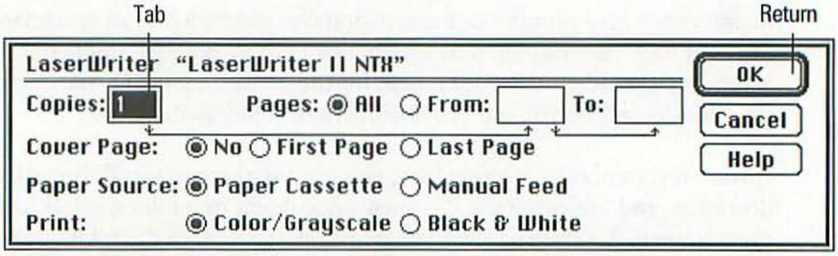
Because the Start Search button is highlighted with a heavily outlined border, pressing the Enter key automatically chooses it. In any dialog box with a heavy-bordered button, pressing Enter is the same as clicking that button. Pressing the Return key usually (although not always) performs the same result.

When you use Tab to jump between text boxes, the Mac selects any text previously entered. That means you can type new text without having to backspace over an existing entry. Most database managers also let you move from one field to the next using Tab, and to the previous field using Shift-Tab. Spreadsheets use Tab and Shift-Tab to move one cell to the right or left, and Return and Shift-Return to move up or down one cell.

Assessing your Option key options

In many programs, holding down the Option key while choosing a command or using the mouse produces a different result than that of the original action. Many times, these modified effects aren't discussed in the program's manual; you're left to discover them on your own or hear about them from other sources.

In the Finder, you can close all open windows by holding down Option while clicking a window's close box. In System 6, pressing Option while choosing the Finder's Eject command (or while clicking the Eject button in an Open or Save dialog box)



LaserWriter "LaserWriter II NTX"

Copies: 1 Pages: ● All ○ From: To:

Cover Page: ● No ○ First Page ○ Last Page

Paper Source: ● Paper Cassette ○ Manual Feed

Print: ● Color/Grayscale ○ Black & White

Figure 1-10: Dialog Box Shortcuts In dialog boxes with multiple text-entry boxes, pressing Tab moves the insertion point from one text box to the next. Pressing Return or Enter selects the bold-outlined button. To print a partial range of pages rather than an entire document, you often don't need to type values in both the From and To boxes. For example, to print pages 1 through 5, type **5** in the To box and leave the From box blank. Similarly, to print starting at page 3 and continuing to the end of the document, type **3** in the From box and leave the To box blank.

tells the Mac to eject the disk and remove its icon from the desktop — as if you dragged the disk's icon to the Trash. For this trick to work, you need to hold down the Option key until the disk has been ejected from the drive.

In most painting programs, pressing Option while dragging a selection duplicates that selection. Adobe Illustrator uses the Option key to modify the effects of numerous commands. In all of Claris' products except MacPaint, pressing Option while choosing the About command from the Apple menu displays a window containing technical information about your Mac. Sometimes the Option key even unlocks secret messages created by mischievous programmers.

While Option seems to be the favored modifier key, some programs use Shift, ⌘, or both. In Word, for example, pressing Shift while choosing Open tells the program to display a list of all files, instead of just word processing documents.

Navigation nooks and keyboard crannies

For Mac users who like navigation shortcuts, Microsoft's programs, especially Word and Excel, are what musty second-hand stores are to antique hounds. In dialog boxes, you can double-click on a radio button to select it and confirm the dialog box. Double-click a window's title bar, and the window shrinks to half size; double-click again, and it returns to normal. (Many other Mac developers have adopted this one.) Press ⌘-period (.) to cancel a dialog box. You can also press the Esc key on keyboards that have one. Faced with a Save Changes? dialog box, press Y, N, or C to answer yes, no or cancel. (This works with QuarkXPress and many other programs, too.)

Word even lets you choose menu commands and dialog-box options with the keyboard. Press the period key on the Mac's numeric keypad (or ⌘-Tab on those lacking keypads), and then the first letter of the menu. When the menu appears, press the first letter of the desired command (or use the direction keys to highlight the command) and then choose it by pressing Return. In dialog boxes, you can "press" a button by holding down the ⌘ key while typing the button's first letter. You can even select radio buttons from the keyboard, but doing so requires such a finger-tangling combination of keystrokes that it's only worth doing if your mouse goes feet up. (System 7, as Chapter 23 describes, also provides many of these options.)

Of course, Microsoft doesn't have a monopoly on clever shortcuts. Many other programs let you select dialog-box buttons by pressing the ⌘ key along with the button's first letter. HyperCard provides *power keys* that let you issue commands with a single keystroke when a drawing or other nontext-entry tool is active; that is, when there's no blinking insertion point on screen. In HyperCard, for example, pressing *A* chooses Select All, *H* chooses Flip Horizontal, and *V* chooses Flip Vertical.

Consider a copilot

Any pilot will tell you that navigation is easier if you have a copilot. You can create your own keyboard shortcuts using a *macro* utility such as QuicKeys from CE Software and Tempo II Plus from Affinity Microsystems, both of which I look at in Chapter 25.

Jargon 101 — Mac Terminology

The computer field abounds with arcane terms, the worst of which are acronyms. Acronyms are those leftovers in language's bowl of alphabet soup — cryptic letter combinations often thrown together without the courtesy of a vowel to make them pronounceable. And pronouncing them is only part of the problem; understanding them is the other.

QUICK TIPS

Other Stops on the Road to Mastery

Familiarizing yourself with the concepts, shortcuts, and commands I present in this chapter will take you a long way toward mastering your Mac. Here are a few more suggestions:

- *Read* Many advanced Mac users brag that they never crack a manual — even when learning a new program. It's a testament to the Mac's graphical interface and to software designers that this is possible. Nonetheless, every program has its subtle points, and you're unlikely to find them unless you read or at least browse the manual. If you haven't already, work through the tutorials in the Mac's manual and in your program's manuals. More good places to uncover the hidden treasures of your favorite applications are in *Macworld*'s Quick Tips columns and in user-group newsletters.
- *Register your software* By sending in the registration cards that accompany new programs, you'll be eligible for technical support and be notified when new versions are developed. Many companies offer newsletters containing tips and insights on their wares, and some also operate customer support forums on communications services such as CompuServe and America Online.
- *Join a user group* As I mentioned earlier in this chapter, they're among the best sources of information, assistance, and free or nearly free software.
- *Take time to play* Set aside time to experiment with your programs and desk accessories and with the Finder's many commands and options. Try selecting text by double clicking, dragging, and Shift-clicking. Conquer the scroll bars. Use a marquee to select groups of icons in the Finder. Press Option or ⌘ while choosing menu commands or clicking palette icons. Keep exploring. You'll become more adept at using the Mac's interface, you'll develop a better understanding of how the Mac works, and you'll be able to tailor your Mac to your tastes.

But behind every acronym are real, sometimes comprehensible words. Understanding those words and their meanings is an important first step in mastering the Macintosh. This section descrambles some acronyms and looks at some of the other jargon you're likely to encounter in the Macintosh world. Don't feel like you have to wade through this material right now. If you're anxious to start using the Mac, skip on to the next chapter; you can always return to this section later if you like.

ADB — The Apple Desktop Bus

The Mac's *input devices* — its keyboard and mouse — attach to its *ADB* connector. ADB stands for *Apple Desktop Bus*, an expansion system designed for input devices. (In the computer world, a *bus* is a set of wires that form a common pathway for data.) Some Macs provide one ADB connector; others provide two. (The Plus and earlier Macs used a different, less versatile method to communicate with their mice and keyboards.)

Mac keyboards provide two ADB connectors. That's how Macs with only one ADB connector can accommodate both a keyboard and a mouse — you plug your mouse into one of the keyboard's ADB connectors, and then use a cable to connect the keyboard's second ADB connector to your Mac. This technique is called *daisy chaining*.

You can use the daisy chaining technique to attach up to three ADB input devices to a single ADB connector. Chapter 34 takes a closer look at alternative input devices and ADB.

SCSI — Small Computer Systems Interface

The ADB is a relatively slow bus; it transfers only about 4,500 bits — or 90 words — per second. That's certainly faster than anyone can type, but it's pretty slow as buses go. It's far too slow for performance-oriented add-ons like hard disks. At about 90 words per second, loading a 10-page document into memory would take over 27 seconds. You'd grow old waiting for large programs to start up.

One way the Mac accommodates high-performance add-ons is with the *SCSI* bus. Short for *Small Computer Systems Interface* and inelegantly pronounced *scuzzy*, the SCSI bus can transfer millions of bits per second. SCSI is most commonly used for hard disks, but it's also used by image scanners, CD-ROM drives, some printers, and tape-backup drives — all add-ons that benefit from fast data transfer.

Like ADB, the SCSI bus lets you daisy-chain peripherals to connect numerous add-ons to a single, rear-panel connector. While the ADB is limited to three devices, SCSI supports up to seven. Nearly all external SCSI devices have two 50-pin connectors, although some use 25-pin connectors like the one on the back of the Mac's case. In either case, you connect the first peripheral to the Mac's SCSI port. Then, if the peripheral has a 50-pin connector, use Apple's *Peripheral Interface Cable* to attach a second peripheral to it. If the device has a 25-pin connector, use another SCSI system cable.

When connecting multiple SCSI devices to the Mac, you'll need to contend with the black art of SCSI *termination,* which involves using small connectors called *terminators* to tell the Mac where the SCSI bus begins and ends. Chapter 27 provides more details on SCSI addressing and termination.

RAM and ROM — the Mac's memory

Two of the most common acronyms you're likely to encounter are *RAM* and *ROM.* Both refer to the types of memory chips used in a Mac.

Prerecorded memory

ROM stands for *read-only memory:* The Mac can read the contents of a ROM chip, but it can't change them. A ROM chip's software is in there for good, prerecorded at the factory like the music on a compact disc. The only real threat to ROM is an electrical mishap such as a power surge or a spark of static electricity.

In most computers, ROM holds only a small amount of *system software,* that program code that enables the machine to run. The Mac's ROM plays a much more significant role. It contains software that programmers call on to create pull-down menus, windows, dialog boxes — all the trappings of the Mac's user interface. (These routines are often collectively described as the *Toolbox.*) This built-in personality is what makes almost all Macintosh programs look and operate in the same basic way. ROM also stores diagnostic routines that swing into action when you switch the Mac on, testing its hardware for problems and then displaying the familiar where's-the-disk? icon.

Memory that forgets

If a ROM chip is like a phonograph album, a RAM chip is like a cassette tape or floppy disk: It's initially blank, and its contents can be changed over and over again. RAM stands for *random-access memory.* Because it can be written to as well as read from, it's sometimes called *read-write memory.*

RAM performs the vital job of storing the documents you create and the software you use to create them. RAM is the Mac's temporary workspace: When you start a program, one of the Mac's first jobs is to copy the program from disk into RAM. Similarly, the Finder loads into RAM when you start up the Mac.

RAM is versatile but vulnerable. Cassettes and floppy disks store information using magnetic particles oriented in patterns that remain intact until another magnetic field comes along to change them. A RAM chip, on the other hand, uses millions of microscopic electronic switches that stay in place only as long as the chips have a steady, reliable supply of power. That's why programs have Save commands — and why it's a good idea to use them often.

The CPU

RAM, ROM, and the rest would be nothing without the *central processing unit*, or CPU. The CPU is the microprocessor chip that executes the individual instructions that form a program, and that shepherds data between disk and memory and between memory and other components. In short, the CPU has a hand in almost every task performed by the computer.

The faster the better

A microprocessor's activity follows the beat of an extremely stable electronic metronome. Many factors govern a computer's speed, but the number of times per second the machine's metronome ticks is foremost among them. The clock governing the Mac Classic's microprocessor ticks roughly 8 million times per second, giving this Mac a *clock rate* of 8 million hertz (cycles per second), or *8MHz* (pronounced *megahertz)*. By contrast, the clock for the Quadra 840AV processor ticks at a sprightly 40 million times per second, or 40MHz.

The 68000 family

Macs have grown faster and more sophisticated over the years; one key to their evolution has been Apple's use of increasingly powerful CPU chips. The Mac family uses Motorola's 68000 series of microprocessors. The slowest Macs use the Motorola MC68000, usually just called *68000* for short. Examples of 68000-based Macs include the Classic, PowerBook 100, SE, Plus, the primordial 128K and 512K Macs.

The 68020

The original Macintosh LC used the 68020, often pronounced *sixty-eight-oh-twenty*, or simply *oh-twenty*, for short. The original Macintosh II, introduced in 1987 and discontinued in 1988, also used the 68020. This chip is superior to the 68000 for a few reasons. It's a true *32-bit* microprocessor, which means it works with information in 32-bit chunks. The less-sophisticated 68000 is a hybrid 16- and 32-bit processor: it handles information in 32-bit chunks internally, but transfers it to external components such as RAM chips in 16-bit chunks. The 68020, by working with 32 bits of information internally and externally, can shuttle twice the data in the same amount of time. (The Mac LC and LC II don't fully take advantage of this feature. These machines use 16-bit external data paths. The Mac LC III doesn't have this shortcoming.)

Another 68020 advantage is its built-in, 256-byte *instruction cache*, high-speed memory that holds the instructions that the CPU used most recently. If those instructions are needed again, they're supplied by the cache, eliminating the need for the CPU to access RAM, which takes more time.

The 68030

The 68030 is used by the Mac SE/30, Classic II, Color Classic, IIsi, IIci, IIcx, IIx, LC III, and LC520. The PowerBook 145B through 180c models also use the 68030, as do the Duo 210 and 230.

The 68030 has the same advantages of the 68020, and adds some pluses of its own. One is a built-in *paged memory management unit*, or *PMMU*. The PMMU is used by System 7's virtual memory feature, which tricks the system software into thinking you have more memory than you actually have. Apple's AU/X, a version of the Unix operating system popular in many universities and engineering and research settings, also uses the PMMU. As mentioned earlier, Macs that use the 68020 do not support virtual memory unless you buy an optional PMMU chip, the Motorola 68851.

The 68030 also provides a built-in 256-byte data cache, which holds the most recently used data just in case it's needed again. The instruction cache present in the 68020 is here, too. (Note the difference between instructions and data: Instructions tell the CPU what to do next, while data is what the instructions affect.)

The 68030 also contains twice the number of internal data pathways than the 68020, and they work in parallel, allowing the CPU to do several things at once — such as access its instruction cache, data cache, and your RAM chips. Adding more data pathways to a chip is like adding lanes to a freeway: It lets more traffic move in the same amount of time.

The 68040

The fastest 68000-family Macs use the Motorola 68040, which is faster and more sophisticated still. The 68040 contains four times the number of transistors as the 68030: 1.2 million. Like the 030, the 68040 contains a built-in PMMU. The 040 also contains a subset of the 68882 math coprocessor. This enables the 040 to handle most (but not all) of the math calculations that would normally be handled by a math chip.

Other improvements in the 68040 include two built-in, 4K caches — one for data and one for instructions. (The 68030 also contains data and instruction caches, but each holds only 256 bytes.) The caches can operate in a faster mode called *copy-back* mode. It's this mode that caused compatibility problems with some application programs when the first Mac Quadras were released. The 68040 also has a six-stage *pipeline* design. *Pipelining* is the process of decoding and executing several program instructions at the same time. An instruction pipeline works much like an assembly line: Each stage works on its own portion of a given program instruction.

Coprocessors — CPU sidekicks

Any good business manager knows that being able to delegate work to specialists makes a manager more productive and efficient. Ditto for a computer's CPU. The 68020 and 68030 are able to delegate certain tasks to specialized microprocessors called *coprocessors*. Coprocessors lighten the load on the CPU, freeing it to do what it does best — supervise the overall operation of the computer's components.

Math coprocessors

The most common coprocessor is a *math coprocessor*, a chip with a head for figures. A math coprocessor can perform complex calculations far more quickly than a general-purpose processor like the 68020 or 68030. Specifically, math coprocessors excel at *floating point* calculations — calculations involving numbers with decimal portions, such as 3.1415926. Most 68030-based Macs contain or accept an optional Motorola 68882 math coprocessor. The original Mac II used the 68882's predecessor, the 68881.

Specialized coprocessors

The Mac IIfx and the AV Macs such as the Quadra 840AV use several specialized coprocessors that assist in transferring data to and from the computer's modem, printer, and SCSI ports. In other Macs, the CPU has to be intimately involved in the transfer of data to or from these ports. In the IIfx and AV Macs, specialized processors handle data transfers to and from the modem and printer ports, while another chip shuttles information between RAM and the SCSI port.

Graphics coprocessors

If you plan to do high-end color graphics work on your Mac, you'll probably encounter *graphics coprocessors* like American Micro Devices' *AMD29000* chip. Graphics coprocessors specialize in performing the types of calculations and data transfers involved in drawing complex color graphics on the screen. Apple's Macintosh Display Card 8•24GC uses the AMD29000.

Digital signal processors

Yet another type of coprocessor is a *digital signal processor (DSP)* chip, such as Motorola's *56001* chip. In the Mac world, DSP chips are most commonly used by digital audio expansion boards such as Digidesign's Audiomedia II card, which lets Macs record and play back sound with the fidelity of a compact disc. (I used an Audiomedia II card to record the audio portion of the *Macworld Complete Mac CD.*) DSP chips are also used in expansion boards that speed the performance of image-editing programs such as Adobe Photoshop (see Chapter 14).

AV Macs such as the Centris 660AV and Quadra 840AV contain an AT&T 3210 DSP chip. The DSP chip drives these Macs' high-speed GeoPort connector, which is designed for telephony and telecommunications functions. The DSP chip runs its own system software — the Apple Real-Time Architecture (ARTA) — that allows signal processing to occur independently of the Mac's 68040 processor. The Centris 660AV's DSP chip runs at 55MHz; the Quadra 840AV's sizzles at 66MHz.

The DSP chips in an AV Macs are one of the key players in their ability to recognize and respond to spoken commands through Apple's PlainTalk technology. Chapter 34 describes PlainTalk and voice recognition in more detail.

Letter Rip

I've covered the most common Mac acronyms and terms in this chapter, but there are many others, as well as a world of abbreviations. I include some of them in this chapter's "Concepts and Terms" box. When you run into one that isn't covered in this chapter, consult the index to find where it's discussed.

In the end, most acronyms are just someone's nasty way of turning a few understandable words into a mysterious jumble of letters. You simply have to find out what the letters stand for.

Of course, pronunciation can also be a problem. SCSI may be pronounced as a word, but you'll get strange looks if you ask someone what kind of cippu his or her Mac contains.

CHAPTER 1 CONCEPTS AND TERMS

- Finding the right Macintosh involves assessing your requirements in the following areas: speed, portability, expandability, video features, and memory- and disk-storage capacity.
- Of the used or discontinued Macs, those with expansion slots are the least prone to obsolescence.
- If you're interested in a portable Mac, you need to decide between an all-in-one PowerBook (such as a 145B or 180c) and a PowerBook Duo. The Duo models are smaller but require docking stations to provide most connection ports.
- The Macintosh Performa line, sold in department stores, consumer electronics stores, and office-supply outlets, differs from most other Mac models in that the keyboard, video display, and software are included.
- You can often save money by buying non-Apple products, but be aware that some third-party products may not offer the same features or plug-and-play convenience of Apple products.
- The Finder is the link between you and the programs and documents on your hard disk. You use the Finder to open programs and documents and manage the contents of disks.
- To use your Mac efficiently, master Mac navigation techniques such as scrolling, selecting, and managing windows.
- Most programs provide keyboard shortcuts that enable you to choose commands and options without having to reach for the mouse.
- Version numbers indicate program revisions. You can determine a program's version number by using the Finder's Get Info command or by choosing the program's About command (in the Apple menu).
- Behind every Mac acronym — SCSI, ADB, CPU, and so on — are real words; understanding these words and their meanings is an important first step in mastering the Mac.
- Increasingly powerful CPU chips — the 68000, 68020, 68030, and 68040 — have helped the Mac family grow faster and more sophisticated.
- Coprocessors are specialized microprocessors that lighten the load on the CPU, freeing it to do what it does best: supervise the computer's overall operation.

⌘-key shortcut
A keyboard shortcut that involves pressing the ⌘ key along with a letter or number key. ⌘-key sequences let you execute commands from the keyboard so you can bypass the mouse. These shortcuts are especially useful in text-oriented programs like word processors, because they let you issue commands without moving a hand from the keyboard.

32-bit microprocessor
A process that works with information in 32-bit chunks. The 68020, 68030, and 68040 processors are 32-bit processors. The 68000 processor used in earlier Macs is a hybrid 16- and 32-bit processor: it handles information in 32-bit chunks internally, but transfers it to external components such as RAM chips in 16-bit chunks.

active window
The frontmost window on the screen, and the one that you can scroll through and whose contents you can manipulate. You can have many windows open on the screen at once, but only one is active. The active window has thin horizontal stripes in its title bar; an inactive window doesn't.

Apple menu
The leftmost menu on the menu bar, represented by the Apple logo ( ). The Apple menu is always available regardless of the program you're using. As Chapter 23 describes, you can customize the Apple menu to contain the names of items you use most.

central processing unit
Abbreviated CPU, the microprocessor chip that executes the individual instructions that form a program, and that shepherds data between disk and memory and between memory and other components.

clicking
Pressing and then releasing the mouse button — the cornerstone of Mac operating techniques.

Clipboard
A simple data-exchange system that enables you to move information between documents and programs. The Edit menu's Cut, Copy, and Paste commands are the gateways to the Clipboard.

clock rate
The speed at which the computer's central processing unit operates. Many factors influence performance, but generally, the faster the clock rate, the faster the computer. Clock rates are measured in millions of cycles per second, or megahertz (MHz).

compact Mac
A Mac, such as the SE, Classic II, and Color Classic, that provides a built-in monitor.

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desk accessories
Handy programs you can select while running another program, such as a word processor. The Mac comes with numerous desk accessories. Some, such as the Calculator and Alarm Clock, mimic real-world desk accessories. Others, such as the Chooser, let you manage certain aspects of the Mac's operation.

desktop
Your electronic work surface, upon which rest icons for programs, documents, folders, disks, and the Trash.

dialog box
A special kind of window that opens after you choose a command. Dialog boxes contain *buttons, check boxes, text boxes,* and other elements that let you provide more information and select various options after you've chosen a command. For example, when you choose the Print command, you get a dialog box that, among other things, lets you specify which pages you want to print and how many copies you want.

digital signal processor
Abbreviated DSP, a type of coprocessor designed to manipulate massive amounts of data in real time. DSP chips are built into Apple's AV Macs and are available on expansion boards for many other Mac models.

docking station
A hardware device that attaches to a PowerBook Duo and adds connection ports and, in some cases, expansion slots and other features.

double-clicking
Pressing the mouse button twice in rapid succession. In the Finder, double-clicking is a shortcut for opening an icon.

dragging
The process of moving the mouse while holding down its button. You move windows by dragging their title bars. In the Finder, you move icons by dragging them. In a graphics program, dragging lets you draw with the tool that's selected in the program's palette. You can also reposition items by selecting them, and then dragging. And in programs and dialog boxes that let you edit text, you can select text by dragging the pointer across it.

expansion slot
A connector, located on a Mac's main circuit board, into which you can plug *cards* or *boards* that add to the machine's capabilities. *Accelerator boards* boost performance, for example, while *video boards* control monitors. Expansion slots are an excellent defense against obsolescence.

graphical user interface
The on-screen menus and other devices you use to control the Mac and its programs.

icon
A pictorial representation of an object, such as a disk, or of functions such as the Trash can.

input device
A hardware device that lets you supply information or commands to the Mac. The keyboard and mouse are the primary input devices. On a Mac that supports PlainTalk voice recognition, the microphone is also an input device.

insertion point
The blinking vertical bar that appears in word processors, in the text-entry portions of dialog boxes, and in any program that works with text. Characters you type always appear at the insertion point.

instruction cache
High-speed memory that holds the instructions that the CPU used most recently. If those instructions are needed again, they're supplied by the cache, eliminating the need for the CPU to access RAM, which takes more time.

launch
The meal that New Englanders eat between breakfast and dinner. Also, a term often used to describe the process of starting a program, as in, "I launched Microsoft Word."

liquid-crystal display
Abbreviated LCD, the type of display screen used in PowerBook computers. Some PowerBooks use *passive-matrix* displays; others use *active-matrix* displays, which are brighter and easier to read.

menu bar
The horizontal list of menu names at the top of the Mac's screen. When you start a program, it takes over the menu bar, replacing the menus that were there with its own. Nearly all programs provide File and Edit menus, but the menus' commands usually differ between programs.

modular Mac
A Mac, such as a Centris or Quadra model, that uses an external monitor.

palette
A row of icons that control a program's functions. Many graphics programs, for example, have palettes containing pencil, eraser, and paintbrush icons (among others). A palette may also be called a *toolbox* or *toolbar.*

pixel
Short for *picture element,* a dot formed on the Mac's screen by the electron gun in its video tube. Everything you see on the Mac's screen is formed by an arrangement of pixels.

pointer
The on-screen arrow that moves when you move the Mac's mouse. The pointer is sometimes described (incorrectly) as the *cursor.*

RAM
An acronym for *random-access memory,* the memory that stores the program you run and the documents you create.

ROM
An acronym for *read-only memory:* The Mac can read the contents of a ROM chip, but it can't change them. A ROM chip's software is in there for good, prerecorded at the factory like the music on a compact disc.

selecting
The process of marking, or *highlighting,* something as a prelude to a subsequent

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operation. For example, you select an icon before opening it. You also select text before deleting it or changing its appearance.

Shift-click
A selection technique that involves pressing the Shift key while clicking in order to *extend* a selection — that is, to add additional items or text to that which is already selected.

Single Inline Memory Module
Abbreviated SIMM, a small circuit board containing memory chips. In most Macs, you add memory by adding SIMMs or by replacing the existing ones with SIMMs of a higher capacity.

system software
The fundamental software that enables the Mac to run. The latest version of the Mac's system software is called System 7. A more sophisticated version of System 7, called System 7 Pro, provides additional features (see the Late Breaking News addendum at the end of this book).

third party
The party you go to after attending the first and second parties. Also, computer industry jargon for a company other than the company that manufactured a given product. For example, Hewlett-Packard is considered a third-party supplier of Mac-compatible printers, and Microsoft is a third-party software supplier.

windows
Viewing portals that let you see the contents of a disk or document. Windows have standard elements that let you move them on the desktop, change their size, *close* them (make them disappear), and *scroll* through them (view information that isn't currently visible within a window's boundaries). See *active window.*

CHAPTER TWO

Word Processing Basics

IN THIS CHAPTER

- Getting the most from word processor features such as easy text entry, effortless editing, and powerful formatting
- Creating indents and tabs with today's most popular programs
- Taking advantage of your word processor's formatting features
- Shopping for the word processor that suits your needs

If you're like most Macintosh users, you use a word processor more than any other program. Whether you peck out occasional memos or write reams of technical manuals, a word processor's benefits — convenient text entry, easy revision, and formatting flexibility — are among the best reasons to use a computer.

Regardless of which word whacker you use, chances are your word processing life will take you through similar formatting terrain. This chapter looks at the basics behind word processing and shows you how to conquer common formatting chores with today's most popular word processors. Many of the concepts and instructions here also apply to integrated programs such as ClarisWorks and Microsoft Works.

If you're shopping for a word processor, use the instructions in this chapter to assess how each program handles each task. The Background box "Shopping for a Word Processor" introduces some advanced features you'll encounter in the next two chapters.

The Basics

At its simplest level, word processing means using a computer to supplant a typewriter by typing and editing your words on screen, and sending them to paper only when you're satisfied with the results. The cornerstone of a word processor's text-slinging skills is a function called *word wrap,* which brings words that don't fit on a line down to the next line as you type. Word wrap means not having to visit the Return key at the end of every line, and it lets a word processor quickly adjust line breaks when you add or remove text.

ON THE CD

- Jim Heid's Word Guide Online
- WordPerfect
- WriteNow

BACKGROUNDER

Shopping for a Word Processor

Here's a look at some helpful word processing features and some points to consider when shopping.

Shortcuts make editing easier

When the creative juices are flowing, you don't want to have to grope for the mouse to choose common commands. Better word processors provide a selection of keyboard shortcuts for choosing commands and moving text. Microsoft Word, WordPerfect, and Nisus Software's Nisus provide keyboard shortcuts for every command and even let you access dialog box options. Word also has slick shortcuts for copying and moving text without replacing the Clipboard's contents.

WordPerfect and Nisus let you create macros to automate command sequences. For example, if your last step in creating a document involves selecting all of its text, changing its font, and then choosing the Print command, you can create a macro that performs these tasks for you when you press a single keystroke. Nisus offers the most sophisticated macro and search-and-replace features. It can be a tricky program to learn, but it's fast and powerful, and has attracted a loyal, if relatively small, following.

Outliners help you develop the big picture

Many writers develop outlines to determine the structure of a document. Word and WordPerfect contain built-in outliners that let you use the mouse to rearrange your thoughts. Some people also use outliners to create to-do lists and small databases. Symmetry Corporation's Acta outliner desk accessory is shown in the figure below. The item "Graphic Variations" has been collapsed — its subtopics aren't visible. One advantage to using a desk accessory outliner is that it's available in any program. As you'll see in Chapter 16, presentation programs such as Aldus Persuasion and Microsoft PowerPoint also provide outlining features.

Glossaries cut keystrokes

A glossary feature lets you store text and/or graphics you can recall and insert with a couple of keystrokes. You'll find glossary features in Word and Nisus. (For details on working with glossaries in Word, see the

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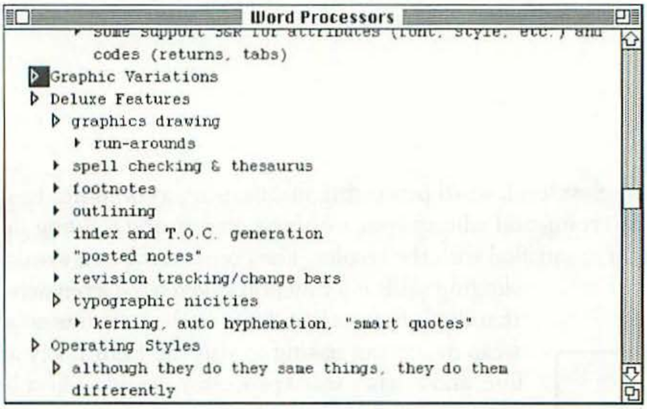

```
      ▸ some support S&R for attributes (font, style, etc.) and
        codes (returns, tabs)
▷ Graphic Variations
▷ Deluxe Features
   ▷ graphics drawing
      ▸ run-arounds
   ▸ spell checking & thesaurus
   ▸ footnotes
   ▸ outlining
   ▸ index and T.O.C. generation
   ▸ "posted notes"
   ▸ revision tracking/change bars
   ▷ typographic nicities
      ▸ kerning, auto hyphenation, "smart quotes"
▷ Operating Styles
   ▷ although they do they same things, they do them
     differently
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next chapter.) If you use WordPerfect, ClarisWorks, or Microsoft Works, you can use macros to insert repetitive text.

Style sheets automate repetitive formatting

A *style sheet* is a collection of typographic, line spacing, and margin formats to which you assign a name, such as "body text" or "headline." Style sheets let you switch between formats with a few keystrokes instead of manually choosing formatting commands. Word, WriteNow, and MacWrite provide style sheet features, and you can get similar results with macros in other programs.

Spelling checkers help you avoid typos

Many word processors provide built-in spelling checkers and thesauri. They're useful, but do have limitations. Spelling checkers don't guarantee accurate spelling or word usage. For example, if you substitute the word *there* for *their,* a spelling checker won't catch the error. But it can still be valuable, especially if your writing contains brand names or industry-specific words. By adding such words to a *user dictionary,* you can tailor your silicon lexicon to your work. Because a thesaurus typically offers numerous (and often quite different) synonyms for a given word, it's up to you to choose the one whose meaning fits the context in which the word will be used. When you find a synonym you like, consult a dictionary to make sure it's appropriate.

Table editors take the tabs out of tables

As mentioned in this chapter, Word 5 and MacWrite Pro offer table-editing features that eliminate the need to set up tabs to create and format multicolumn tables. If you prefer a different word processor, however, you may consider a standalone table-editing program such as Macreations' Tycho. The Aldus PageMaker desktop publishing program includes a serviceable table-editing program too. After creating a table with PageMaker's table editor, you can use the Clipboard to paste it into your word processor.

Mail merge makes form letters "personal"

A *mail merge* or *print merge* feature lets you combine your word processor and a database management program to produce "personalized" form letters — it's how those publishing clearinghouses churn out those giveaway notices. You'll find mail merge features in Word, Microsoft Works, ClarisWorks, WriteNow, MacWrite, WordPerfect, and Nisus.

Annotation provides electronic Post-It notes

In many businesses, documents must journey from desk to desk for revisions and approval. An *annotation* feature provides an electronic version of Post-It notes, enabling you to attach typed comments to a document. Microsoft Word 5 and MacWrite Pro also support voice annotations — recordings you create using the microphone included with most Macs or with third-party recording hardware such as Macromedia's MacRecorder.

Indexing features simplify book making

Word, WordPerfect, and Nisus can automatically generate tables of contents and indexes. Nisus' tables of contents and indexes go into a separate file and are fully editable, but they need to be regenerated each time you change the document. Word and WordPerfect update their tables of contents and indexes automatically, but the indexes they generate are usually not fully editable.

Equation editors get to the root of things

Word includes a program called Equation Editor that lets you create and edit complex mathematical equations. Word also provides a built-in typesetting language that lets you create equations, albeit by typing formatting codes that are almost as complex as many equations. If you work with equations extensively but you don't like Word, consider a third-party equation editor such as Expressionist from Prescience Corporation, Formulator from Icom Simulations, or MathWriter from Cooke Publications.

All word processors also provide formatting features — the capability to specify margin widths, line spacing, and *justification.* The latter is a leap forward from typewriting; you'll be amazed at how easily word processors let you center lines of text or align them against the left or right margins (or both). And with Mac word processors, you can perform all these formatting tasks by clicking buttons and icons on an on-screen ruler. You can display the rulers on most programs by choosing a Show Ruler command.

Word processors also let you adorn the top and bottom of every page of a document with *headers* and *footers* (text, such as a page number, that repeats at the top or bottom of each page). Most Mac word processors let you create different headers and footers for odd- and even-numbered pages, a useful feature if your final product will be bound in book form.

Macintosh word processors also exploit the Mac's text talents, enabling you to format a document using a variety of fonts, styles, and sizes. And they support the Mac's Clipboard, so you can use the Copy and Paste commands to include text and graphics created in other programs in your documents.

Know Thy Rulers

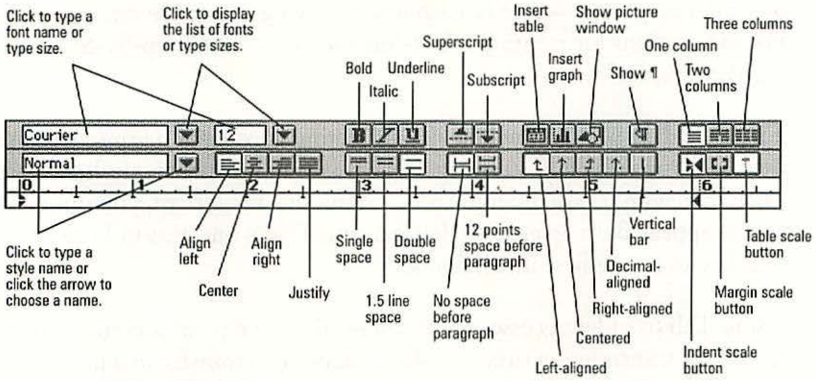
Before you tackle any word processing job, it helps to understand your program's approach to storing such formatting settings as line spacing, paragraph indents, margins, justification, and tabs. All Mac word processors have on-screen rulers for adjusting these settings. Figure 2-1 "Ruler Reminder" shows the components of the rulers used by today's most popular word processors.

With most programs — including Microsoft's Word and Works, WordPerfect, WordStar's WriteNow, and Claris' ClarisWorks and MacWrite — ruler changes apply only to the paragraph containing the blinking insertion point. If you've selected some text, the changes apply to the highlighted paragraphs. To change an entire document, first select all of it by choosing Select All from the Edit menu. In Word, you can also press the ⌘ key and click in the selection bar along the window's left edge. The bar is invisible, but you'll know you're there when the pointer changes to a right-pointing arrow.

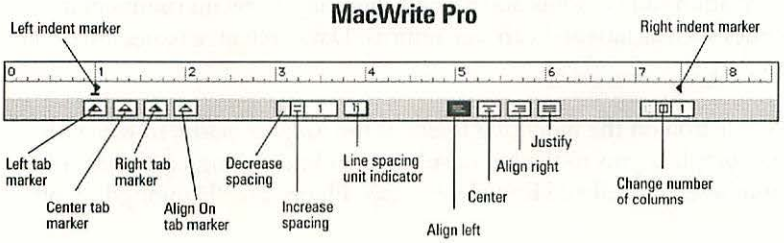
The Lowly Paragraph Indent

Indents are indents, right? Wrong. There's more than one way to bump a paragraph's first line to the right. My favorite method is to press Tab. All programs offer preset tab settings, usually spaced at ½-inch intervals. So by pressing Tab at the beginning of a paragraph, you indent its first line ½-inch.

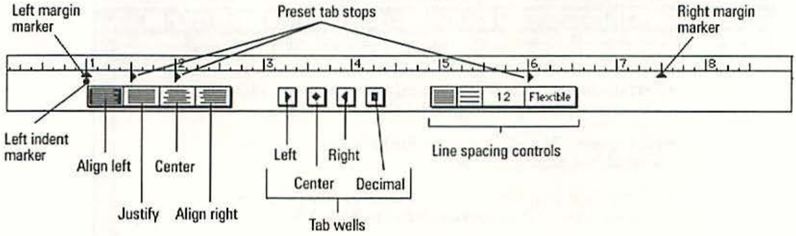
Microsoft Word 5.1



MacWrite Pro



WriteNow



WordPerfect

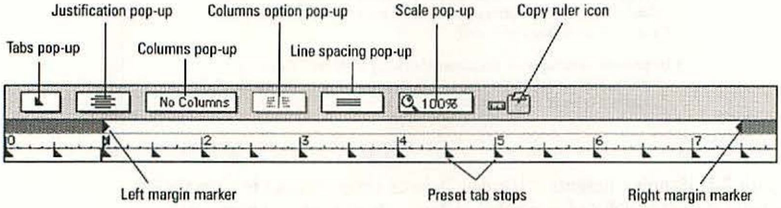


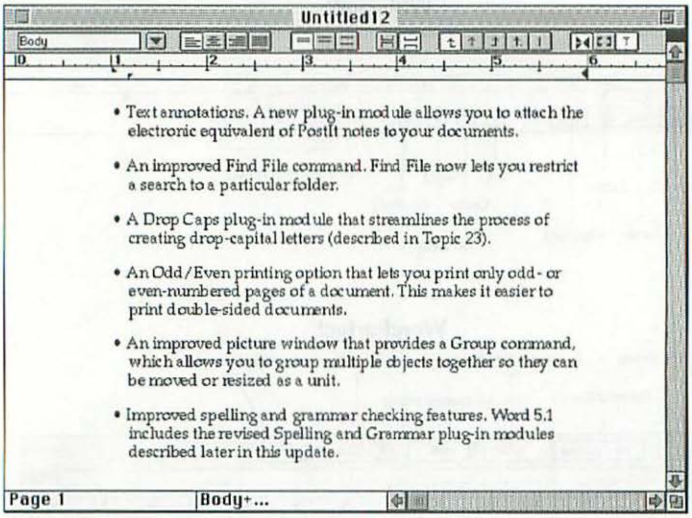
Figure 2-1: Ruler Reminder A ruler is the gateway to a word processor's tab, margin, line spacing, and justification features. Shown here are components you can find in the rulers of today's most popular word processing programs.

Another method is to use the ruler to create a *first-line indent*, in which the first line of every paragraph — that is, each line following a carriage return — is indented. For instructions for creating a first-line indent, see the Step-by-Step box "Indenting Paragraphs."

There's a drawback to the first-line indenting approach: Because word processors treat any line ending in a carriage return as a paragraph, single-line "paragraphs" (such as headings) are indented too. To remove the indent, you must reformat each line to appear flush against the left margin. That's one reason I prefer using the Tab key to create first-line indents.

Using Tab to indent is essential if you need to save your document in *text-only format* for transmission over the phone lines or to transfer to a program that can't read your word processor's document files. Text-only files discard formatting information such as fonts and indents, but they do retain rudimentary formatting codes such as tabs and carriage returns. Data exchange issues are covered in detail in Part II.

A variation on the indenting theme is the *hanging indent*, in which the first line of a paragraph begins to the left of subsequent lines. Hanging indents often appear in numbered or bulleted lists of items (see Figure 2-2 "Hanging Indents").



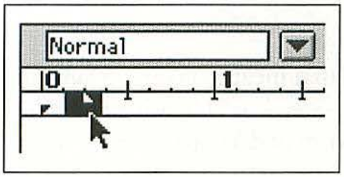
- Text annotations. A new plug-in module allows you to attach the electronic equivalent of PostIt notes to your documents.
- An improved Find File command. Find File now lets you restrict a search to a particular folder.
- A Drop Caps plug-in module that streamlines the process of creating drop-capital letters (described in Topic 23).
- An Odd/Even printing option that lets you print only odd- or even-numbered pages of a document. This makes it easier to print double-sided documents.
- An improved picture window that provides a Group command, which allows you to group multiple objects together so they can be moved or resized as a unit.
- Improved spelling and grammar checking features. Word 5.1 includes the revised Spelling and Grammar plug-in modules described later in this update.

Figure 2-2: Hanging Indents Hanging indents are often used to align the left margins in a list of bulleted or numbered items. Word 5, shown here, lets you create a hanging indent by positioning the indent marker to the right of the left margin marker. Most word processors use a similar technique.

Indenting Paragraphs

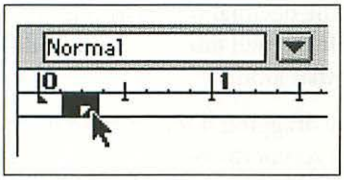
Here's how to create a first-line indent and a hanging indent in several popular programs. These instructions assume your program's ruler is displayed. If it isn't, display it by choosing the appropriate command. (In Word, for example, choose Ruler from the View menu.)

Creating a hanging indent is easier if you've typed at least one of the numbered or bulleted items, so do that first. (If you use bullets, put a space between the bullet and the first character of the item. If you want more space, press Tab.)



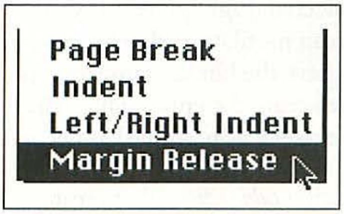
To create a first-line indent in Microsoft Word, WriteNow, or MacWrite:

1. **Place the blinking insertion point in the paragraph to be changed (or before the point where you'll begin typing).**
2. **Drag the ruler's upper indent marker to the right.** Word also lets you use the ⌘-Shift-F keyboard shortcut.



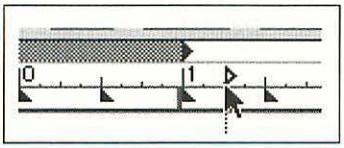
To create a hanging indent in Word:

1. **Place the insertion point within a paragraph, or select multiple paragraphs.**
2. **Press Shift and drag the lower indent marker to the right.** All the lines except the first jump to the right. You can also use the Format menu's Paragraph command to create a hanging indent — make the value in the First box smaller than the value in the Left box.



To create a hanging indent in WordPerfect:

1. **Set the overall indent of the paragraph by using the Layout menu's Indent or Left/Right Indent commands.**
2. **Position the blinking insertion point at the left edge of the paragraph's first line.**
3. **Choose Margin Release from the Layout menu.** The first line moves one tab stop to the left, leaving the rest of the paragraph indented.



To create a first-line indent in WordPerfect:

1. **Drag the ruler's first-line indent marker (the right-pointing, hollow triangle), or choose Paragraph from the Layout menu and type the desired indent value.**

Finally, paragraphs in a legal document or lengthy quotes from another author's work are often indented from both margins. To indent both margins in Word, Works, MacWrite II, or WriteNow, first place the insertion point within the paragraph you're indenting (or select the paragraphs to be indented), and then drag the left and right indent markers toward each other by ½-inch or so. In WordPerfect, choose Left-Right Indent from the Layout menu.

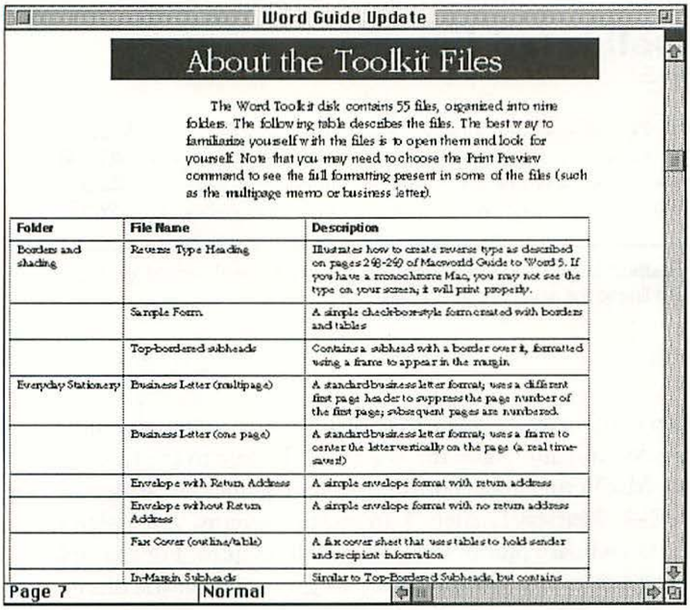
Tables and Tabs

Another common word processing job involves creating *columnar tables*, typically used for such items as tables of contents, financial statements, and baseball standings.

Creating tables means mastering tab features, and that means becoming familiar with your program's on-screen ruler. The Step-by-Step box "Creating and Working with Tabs" shows you how to create tabs in Word and WordPerfect. Here are a few general things to note about tabs.

- ❖ You can center text within tabs or align it against a tab's left or right edge. All programs also provide *decimal tabs*, which align the decimal points in columns of numbers. Most programs are preset to create left-aligned tabs. To create a different kind, first select the icon on the ruler for that kind.
- ❖ With all programs, you adjust a tab's position by dragging it left or right on the ruler. (Word, MacWrite, and WordPerfect also accept measurements in a dialog box for precise positioning.) All programs also let you remove a tab by pointing to it and then dragging it away from the ruler.
- ❖ Remember that in order to refine the tabs in a given line, the blinking insertion point must be in that line, or the line must be selected (highlighted). If you're refining an entire table, select all of it first. You can mutilate a table by dragging tabs left and right without paying attention to where the blinking insertion point is located. You'll always get the best results by selecting the entire table, adjusting the tabs, and then fine-tuning individual lines (such as headings) as needed.

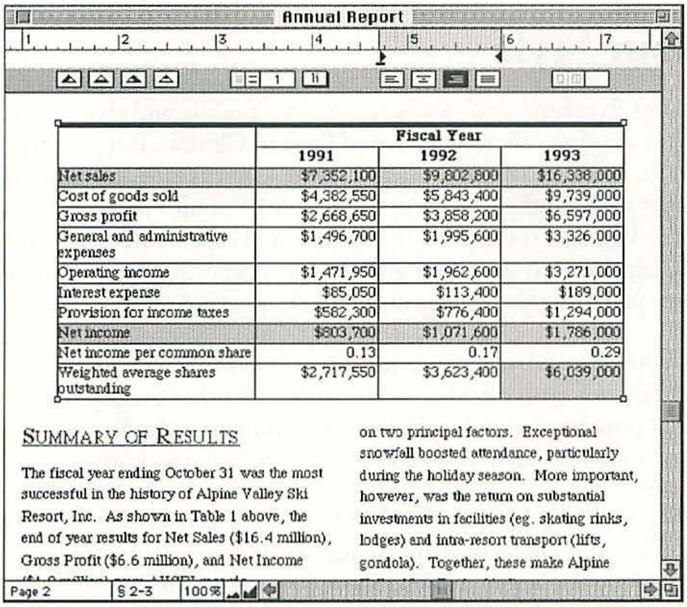
Microsoft Word and MacWrite Pro boast labor-saving *table editors* that create a grid of rows and columns similar to that of a spreadsheet program. You can type tables within this grid without fussing with tabs and rulers, and you can add borders and shading for emphasis. MacWrite Pro's table editor is especially slick — just click the table tool, drag across the page, and specify the size of the table you want (see Figure 2-3 "Editing the Table").



About the Toolkit Files

The Word Toolkit disk contains 55 files, organized into nine folders. The following table describes the files. The best way to familiarize yourself with the files is to open them and look for yourself. Note that you may need to choose the Print Preview command to see the full formatting present in some of the files (such as the multipage memo or business letter).

Folder	File Name	Description
Borders and shading	Reverse Type Heading	Illustrates how to create reverse type as described on pages 248-250 of Macworld Guide to Word 5. If you have a monochrome Mac, you may not see the type on your screen; it will print properly.
	Sample Form	A simple check-box-style form created with borders and tables
	Top-bordered subheads	Contains a subhead with a border over it, formatted using a frame to appear in the margin
Everyday Stationery	Business Letter (multipage)	A standard business letter format; uses a different first page header to suppress the page number of the first page; subsequent pages are numbered.
	Business Letter (one page)	A standard business letter format; uses a frame to center the letter vertically on the page (a real time-saver!)
	Envelope with Return Address	A simple envelope format with return address
	Envelope without Return Address	A simple envelope format with no return address
	Fax Cover (outline/table)	A fax cover sheet that uses tables to hold sender and recipient information
	In-Margin Subheads	Similar to Top-Bordered Subheads, but contains



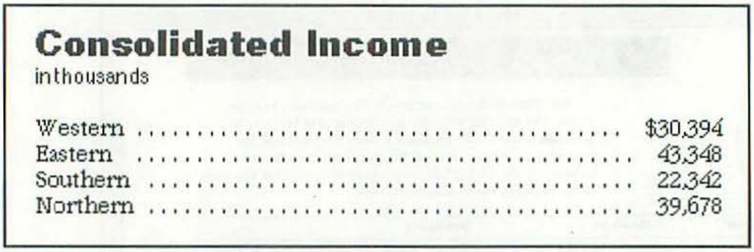
	Fiscal Year		
	1991	1992	1993
Net sales	$7,352,100	$9,802,800	$16,338,000
Cost of goods sold	$4,382,550	$5,843,400	$9,739,000
Gross profit	$2,668,650	$3,858,200	$6,597,000
General and administrative expenses	$1,496,700	$1,995,600	$3,326,000
Operating income	$1,471,950	$1,962,600	$3,271,000
Interest expense	$85,050	$113,400	$189,000
Provision for income taxes	$582,300	$776,400	$1,294,000
Net income	$803,700	$1,071,600	$1,786,000
Net income per common share	0.13	0.17	0.29
Weighted average shares outstanding	$2,717,550	$3,623,400	$6,039,000

SUMMARY OF RESULTS

The fiscal year ending October 31 was the most successful in the history of Alpine Valley Ski Resort, Inc. As shown in Table 1 above, the end of year results for Net Sales ($16.4 million), Gross Profit ($6.6 million), and Net Income

on two principal factors. Exceptional snowfall boosted attendance, particularly during the holiday season. More important, however, was the return on substantial investments in facilities (eg. skating rinks, lodges) and intra-resort transport (lifts, gondola). Together, these make Alpine

Figure 2-3: Editing the Table Two table editors in action: Word 5 (top) and MacWrite Pro (bottom).



Consolidated Income

in thousands

Western	$30,394
Eastern	43,348
Southern	22,342
Northern	39,678

Figure 2-4: Fearless Leaders Leader characters, usually a row of periods, guide a reader across a line to the next column in a table.

Tables often contain *leader characters*, usually a horizontal row of periods, which run across a column and guide the eye along the line to the next column. Word, WriteNow, MacWrite, and WordPerfect let you include leader characters in tables (see Figure 2-4 "Fearless Leaders"). In most programs, you assign the leader character to the tab whose column the leaders will point to. For example, to create a leader between columns two and three, assign the leader to column three's tab.

Changing Your Style

All programs offer *search-and-replace* features for finding and changing text — changing, for example, all occurrences of Bush to Clinton. But not all programs let you search for one type of formatting attribute (such as tabs and font information) and replace it with another. Want to change all 10-point Helvetica text to 12-point Times Bold? Without the capability to search and replace attributes, it's a laborious chore. The capability to search for and replace formatting attributes is a useful feature that lets you quickly change a document's appearance.

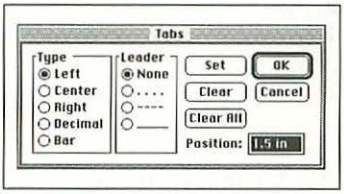
Word lets you locate tab characters and carriage returns by typing ^t or ^p in the Find What text box (you can also choose these and other codes from the dialog box's Special pop-up menu). Word's Change command also lets you replace one font, size, or style with another (see Figure 2-5 "Changing Formatting in Word").

Here's a slick trick that lets you use Word's Change command to quickly reformat an entire paragraph. First, copy the carriage return of the paragraph whose format you want to apply elsewhere (choose Show ¶ from the View menu to see carriage return codes). Then select the carriage return of the paragraph to be changed and choose Paste. To automate the process, type **^p** in the Find What box, and **^c** in the Replace With box. The latter tells Word to replace the text to be changed with the Clipboard's contents.

STEP-BY-STEP

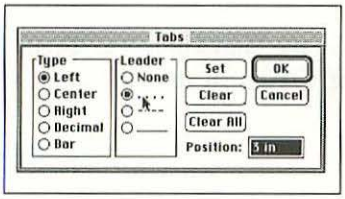
Creating and Working with Tabs

The instructions in this box show you how to create and modify tabs in Word and WordPerfect. These basic concepts also apply to other word processors as well as to integrated programs such as ClarisWorks. These instructions assume your program's ruler is displayed. If it isn't, display it by choosing the appropriate command.



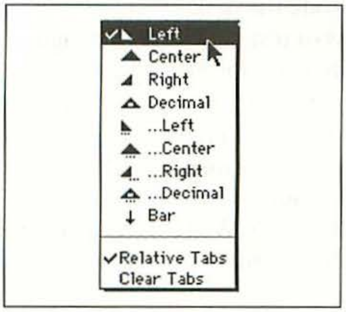
To create a tab in Word:

1. **Be sure the blinking insertion point is located where the table will begin.**
2. **Optional: Specify the type of tab you want (left-aligned, centered, right-aligned, and so on) by clicking the appropriate icon on the ruler.**
   If you don't perform this step, Word creates a left-aligned tab.
3. **Click the ruler at the location you want the tab to appear.**
   You can also double-click any tab icon and then specify precise tab locations using the Tabs dialog box shown at left.



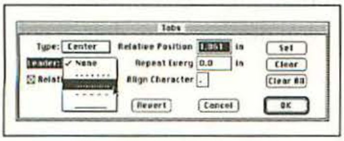
To add leaders to a tab in Word:

1. **If you haven't already, create tabs for each column.**
2. **Double-click on any existing tab in the ruler to display the Tabs dialog box.**
3. **In the ruler, click the tab you want the leaders to point to, and then choose the kind of leader character you want.**
4. **Click OK to apply the changes and close the dialog box.**



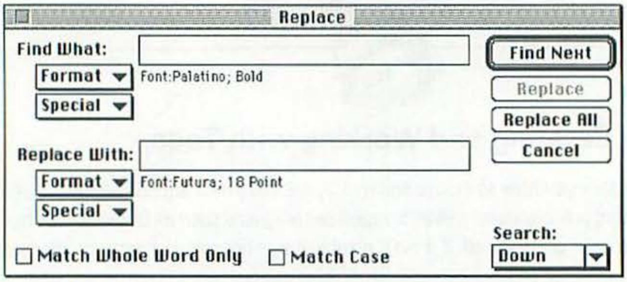
To create a tab in WordPerfect:

1. **Begin by clearing the preset tabs, which appear at ½-inch intervals, choose Tabs from the Line submenu (Layout menu), click the Clear All button, and then click OK.**
2. **Choose the desired tab type from the ruler's Tabs pop-up menu.**
3. **Create the tabs by clicking at the desired locations on the ruler.**
   You can also use the Tabs dialog box, which you can display by choosing Tabs from the Line submenu or double-clicking any existing tab in the ruler.



To add leaders to an existing tab in WordPerfect:

1. **In the ruler, double-click the tab you want the leaders to point to.**
   The Tabs dialog box appears.
2. **Choose the desired leader type from the Leader pop-up menu.**



Find What: Format Font:Palatino; Bold

Replace With: Format Font:Futura; 18 Point

Search: Down

Figure 2-5: Changing Formatting in Word Word's Replace dialog box lets you quickly change formatting. Here, all Palatino Bold text is being changed to 18-point Futura.

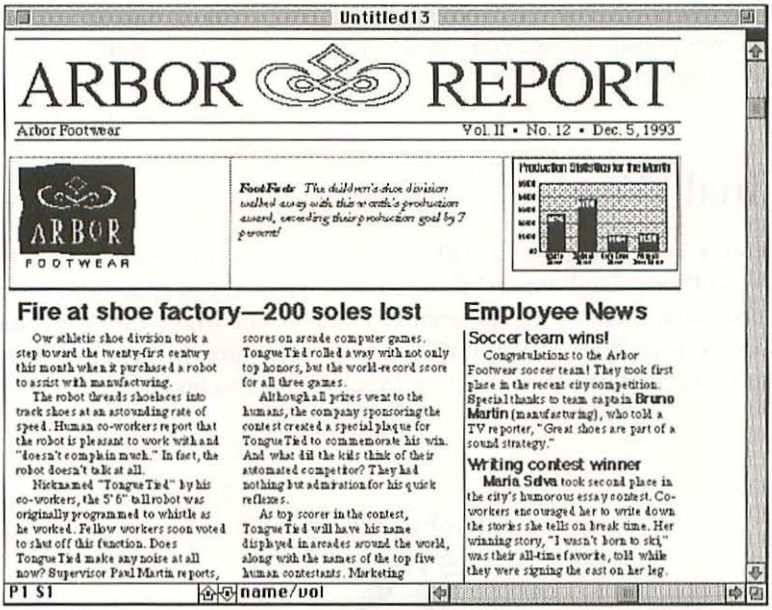
Like Word 5, WordPerfect and MacWrite can search for and replace nearly any formatting attribute. To search and replace attributes in MacWrite, choose Find/Change from the Edit menu and check the Use Attributes check box in the Find/Change dialog box that appears. The dialog box changes to include lists of fonts and attributes that you can select. If you're just searching for text attributes (not attributes as well as specific characters), uncheck the Use Text check box.

In WordPerfect, use the Match and Affect menus in the Find window to specify which attributes you're searching for and replacing. To display the Find window, choose Find/Change from the Search menu.

Citizen Mac

One way in which most Mac word processors infiltrate the desktop publishing camp is by enabling you to create multiple columns of text on a page (see Figure 2-6 "Become a Columnist"). Multicolumn pages are common in newsletters, brochures, and menus. In Word, WriteNow, and MacWrite II, creating multiple columns involves choosing a command and specifying the number of columns you want. In Word, use the Section command from the Format menu. In WriteNow, use Page Setup. In MacWrite II, choose the Page command from the Format menu, or double-click the column border at the top of MacWrite II's ruler or the page number indicator in the lower-left corner of the document window.

In MacWrite Pro, click one of the ruler's column controls. To create columns of unequal width, double-click the ruler's column number. You can adjust column widths with the mouse by pressing Option and then dragging a column guide. (Choose Show Page Guides from the View menu if you don't see the dotted column guides.)



ARBOR REPORT

Arbor Footwear

Vol. II • No. 12 • Dec. 5, 1993

ARBOR FOOTWEAR

FootFacts The children's shoe division walked away with this month's production award, exceeding their production goal by 7 percent!

Fire at shoe factory—200 soles lost

Our athletic shoe division took a step toward the twenty-first century this month when it purchased a robot to assist with manufacturing.

The robot threads shoelaces into track shoes at an astounding rate of speed. Human co-workers report that the robot is pleasant to work with and "doesn't complain much." In fact, the robot doesn't talk at all.

Nicknamed "TongueTied" by his co-workers, the 5' 6" tall robot was originally programmed to whistle as he worked. Fellow workers soon voted to shut off this function. Does TongueTied make any noise at all now? Supervisor Paul Martin reports, scores on arcade computer games. TongueTied rolled away with not only top honors, but the world-record score for all three games.

Although all prizes went to the humans, the company sponsoring the contest created a special plaque for TongueTied to commemorate his win. And what did the kids think of their automated competitor? They had nothing but admiration for his quick reflexes.

As top scorer in the contest, TongueTied will have his name displayed in arcades around the world, along with the names of the top five human contestants. Marketing

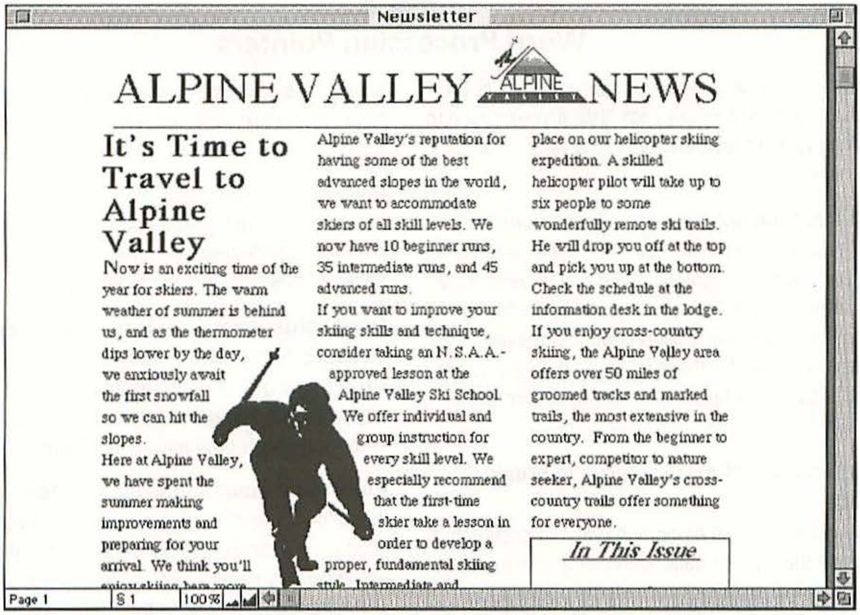
Employee News

Soccer team wins!

Congratulations to the Arbor Footwear soccer team! They took first place in the recent city competition. Special thanks to team captain **Bruno Martin** (manufacturing), who told a TV reporter, "Great shoes are part of a sound strategy."

Writing contest winner

Maria Silva took second place in the city's humorous essay contest. Co-workers encouraged her to write down the stories she tells on break time. Her winning story, "I wasn't born to ski," was their all-time favorite, told while they were signing the cast on her leg.



ALPINE VALLEY NEWS

It's Time to Travel to Alpine Valley

Now is an exciting time of the year for skiers. The warm weather of summer is behind us, and as the thermometer dips lower by the day, we anxiously await the first snowfall so we can hit the slopes.

Here at Alpine Valley, we have spent the summer making improvements and preparing for your arrival. We think you'll enjoy skiing here more Alpine Valley's reputation for having some of the best advanced slopes in the world, we want to accommodate skiers of all skill levels. We now have 10 beginner runs, 35 intermediate runs, and 45 advanced runs.

If you want to improve your skiing skills and technique, consider taking an N.S.A.A.-approved lesson at the Alpine Valley Ski School. We offer individual and group instruction for every skill level. We especially recommend that the first-time skier take a lesson in order to develop a proper, fundamental skiing style. Intermediate and place on our helicopter skiing expedition. A skilled helicopter pilot will take up to six people to some wonderfully remote ski trails. He will drop you off at the top and pick you up at the bottom. Check the schedule at the information desk in the lodge.

If you enjoy cross-country skiing, the Alpine Valley area offers over 50 miles of groomed tracks and marked trails, the most extensive in the country. From the beginner to expert, competitor to nature seeker, Alpine Valley's cross-country trails offer something for everyone.

In This Issue

Figure 2-6: Become a Columnist You don't need a publishing program to publish. Most word processors, including Word 5 (top) and MacWrite Pro (bottom) let you create complex multicolumn pages. Note MacWrite Pro's capability to automatically wrap text margins around a graphic.

In WordPerfect, you can choose the number of columns desired using the ruler's Columns pop-up menu. You can also adjust the columns' widths by dragging the shaded borders in the ruler.

Some Final Words

If you're just getting started with a word processor, read over the Quick Tips box "Word Processing Pointers" for some reminders. If you're still shopping for a word processor, test drive some programs to find the one whose operating style you like. This is especially important if you plan to spend a great deal of time writing. Every word processor has its own feel, and you will want to find one that feels good to you.

Word Processing Pointers

A word processor is among the easier types of programs to get up to speed with. Still, if you're used to working with a typewriter, you may need to break a few habits.

Don't use the spacebar to align or center

On a typewriter, you may use the spacebar to center text and indent paragraphs. With a word processor, it's better to use the on-screen ruler to control centering, indents, column alignment, and the like. If you use the spacebar for these jobs and then you change fonts or sizes, the text will no longer be formatted properly.

Don't use lots of extra returns to break a page

If you want a certain paragraph within a document to begin on the top of a page, don't force it there by typing a lot of extra carriage returns above it. It's better to insert a page break code. (In Word, for instance, choose Page Break from the Insert menu or simply type Shift-Enter.) With this approach, if you reformat the text later, you won't have to search through your document for all those extra returns.

Note that many programs also provide special paragraph-formatting options that let you specify that a paragraph begin on a new page or that two paragraphs always remain together.

Don't forget about the Undo command

If you accidentally delete some text, you can restore it by choosing Undo from the Edit menu before doing anything else. In most programs, Undo also works with formatting commands and ruler alterations.

Polish your punctuation for a professional look

If you have a laser or ink jet printer, following a few simple rules can help make your documents look professionally typeset. See the Quick Reference Card at the front of this book or the Quick Tips box "Type Tips" in Chapter 11.

When you're shopping, don't be wowed by endless lists of features. Gimmicky formatting and drawing features won't help you put your thoughts into words — indeed, they may tempt you to play with fancy formats instead of making another round of revisions. Word processors exist to make writing easier. That's quite a feat in itself.

POWERBOOK ANGLE

Word Processing on the Road

Word processing on a PowerBook portable computer isn't too different from word processing on a desktop Mac, with one big exception: You can process words even when you aren't near a power outlet. Beyond this difference are some less-obvious points you may want to consider.

Keyboard considerations

A PowerBook lacks the function keys and scrolling keys that Apple's extended keyboards provide. For this reason, you may prefer to use a word processor whose scrolling and editing key sequences can be customized. For example, you may use the Shift and Control keys (not the ⌘ key) in combination with the arrow keys to set up key sequences that move you to the start or end of a document, sentence, or paragraph. If you use a program whose scrolling keystrokes can't be customized, there's still hope: a keyboard-enhancement utility such as CE Software's QuicKeys (see Chapter 25). And, of course, if you've plugged your PowerBook into the wall, you can attach an extended keyboard to its rear-panel ADB port.

Memory and disk space: less leaves more

Many PowerBooks contain 40MB or 80MB hard drives — not bad, but not large enough to hold dozens of application programs. Unless you want to buy a higher-capacity hard drive, look for a word processor that's as light and lean as the PowerBook itself. The heavy hitters — Microsoft Word and WordPerfect — have big appetites for both disk space and memory. You can reduce Word's disk requirements by not installing optional features, such as the grammar checker. You can also reduce the memory requirements of these and other programs using the Finder's Get Info command as described in Chapter 23.

A better choice for portable word processing may be a lean-and-mean program such as WordStar's WriteNow, Nisus Software's Nisus Compact, or WordPerfect's LetterPerfect. Another option: an integrated program such as ClarisWorks or Microsoft Works.

CHAPTER 2 CONCEPTS AND TERMS

- Automatic word wrap, easy editing, and effortless formatting are the primary features that set a word processor apart from a typewriter.
- The gateway to most common formatting tasks is a word processor's on-screen ruler.
- Some word processors provide time-saving features such as glossaries, which store often-used text or graphics, and style sheets, which store formatting information. Some programs can also compile indexes and tables of contents.
- When shopping for a word processor, features to consider include: the availability of editing shortcuts, outlining features, glossaries and style sheets, table editors, spelling and grammar checkers, mail merge, and equation editing.
- If you have a PowerBook, you may want to consider a word processor that uses disk space and memory sparingly, such as WriteNow or Nisus Compact.

annotations
Typed (or recorded) comments attached to a document.

columnar tables
Blocks of text that are aligned in columns, such as stock market results or sports standings.

decimal tabs
Tab stops in which the numbers in a column of text are aligned on their decimal points.

first-line indent
A paragraph format in which the first line of every paragraph is indented.

footer
Text and/or graphics that appear at the bottom of every page in a document.

formatting
The capability to specify margin widths, line spacing, justification, fonts, and font size and style.

glossary
What you're reading now. Also, a word processor feature that lets you store and recall often-used text and/or graphics with a single keystroke.

hanging indent
A paragraph format in which the first line begins to the left of subsequent lines.

header
Text and/or graphics that appear at the top of every page in a document.

justification
Aligning text against the left and right margins.

leader characters
Characters (usually a row of periods) that run across a column and guide the eye along the line to the next column.

search-and-replace
A feature that lets you locate some text or a formatting code and either delete it or replace it with something else.

style sheets
Also called *styles,* a named set of character and paragraph formats that you can apply throughout a document.

tabs
Formatting codes that let you indent text or graphics and align columns of numbers in tables.

text-only format
A method of saving a document so that all graphics and most formatting information are discarded, leaving only the text characters and rudimentary formatting such as tab codes and carriage returns.

word wrap
A word processor feature that brings words down to the next line as you type. Word wrap means you don't have to press Return at the end of every line, and it quickly adjusts line breaks when you add or remove text.

CHAPTER THREE

Word Processing Tips and Techniques

IN THIS CHAPTER

- Creating glossaries, style sheets, custom spelling dictionaries, special text effects, and more
- Customizing Word and WordPerfect to match the way you work and write
- Using keyboard and selection shortcuts in Word and WordPerfect

A word processing program lets you concentrate on writing instead of mechanics. Go ahead and type — there's no fussing with paper, no pressing Return at the end of every line, no painting with correction fluid. A variety of fonts, type sizes, and styles is a menu away. Advanced formatting is relatively easy too. An on-screen ruler lets you change margins or create indents and tab stops. You can automatically number pages and create headers and footers that appear at the top and bottom of every page.

If you usually write with a typewriter or if you use a word processor only occasionally, you may not be familiar with the more sophisticated labor-saving features your program provides. Whether you write a memo once a week or a chapter every day, you can save time by customizing your word processor.

I'll examine several customizing techniques in this chapter, and I'll show you how to apply each technique to the Mac world's most popular and powerful word processors: Microsoft Word 5 and WordPerfect Corporation's WordPerfect 2. (For advice on applying these customizing tips to programs such as WordStar's WriteNow, Claris' MacWrite II and MacWrite Pro, ClarisWorks, and Microsoft Works, see the Quick Tips box "Customizing Other Programs.") I'll also pass along some tips and techniques that let you create special effects, navigate through documents quickly, and more.

QUICK TIPS

Customizing Other Programs

If you don't use Word or WordPerfect, you can still apply many customizing techniques to other programs.

Custom spelling checkers

All popular word processors and integrated packages have spelling checkers and support custom dictionaries.

Stationery

You can create stationery with ClarisWorks, WordStar's WriteNow 3, and Claris' MacWrite II and MacWrite Pro. It's worth noting that if you use System 7, you can create stationery from a document created in any program. At the Finder, select the document and choose Get Info from the File menu, and then check the Stationery Pad box. Thereafter, when you open the stationery document, the Finder duplicates the stationery document and then opens the duplicate. Apple built this feature into System 7 to let you create stationery for programs whose Save dialog boxes don't contain a Stationery option.

Glossaries

Only Word has a glossary feature, but ClarisWorks and Microsoft Works have macro recorders that let you record and play back key sequences. You can also save and insert repetitive text in any program using CE Software's QuicKeys keyboard-enhancement utility.

Styles

WriteNow 3.*x* has excellent style features. MacWrite II and ClarisWorks provide a custom styles feature that lets you store and recall character formatting, but not paragraph-level formatting such as line spacing, margins, and indents. (MacWrite Pro does provide paragraph-level styles.) ClarisWorks and Microsoft Works lack style features, but you can simulate them by recording macros that choose formatting commands.

Menu and keyboard customizing

You can use ClarisWorks or Microsoft Works macros to create your own keyboard shortcuts. Better yet, use QuicKeys to create shortcuts for all your programs.

Macros

You can add macro features to any program with CE Software's QuicKeys. It doesn't offer all the power and flexibility of a built-in macro feature, but it does let you record and play back repetitive tasks. And it lets you customize other aspects of your Mac.

Creating a Personal Dictionary

Although a word processor's spelling checker can't guarantee perfect spelling, it can help. But what if you use words that aren't in the program's dictionary? Names, scientific jargon, abbreviations, and slang can confound a spelling checker. And when you're in a hurry to complete a document, it's tempting to click the spelling checker's Ignore or Skip button to bypass those terms you know are spelled correctly.

But wait — instead of telling your program to ignore those terms, add the terms to your user dictionary. Sometimes called a custom dictionary, this is a separate file that supplements the program's built-in dictionary. Adding terms to a user dictionary essentially expands your word processor's vocabulary. The spelling checker will run faster, you won't have to click Ignore all the time, and your documents will be that much more accurate.

For instructions on adding words to a custom dictionary in Word and WordPerfect, see the Step-by-Step box "Customizing a Dictionary."

Word and WordPerfect also let you customize other aspects of their spelling checkers. You can use the Spelling option in the Preferences dialog box to tell Word to ignore words in all-capitals as well as words containing numbers (such as 100K). You can use the Check menu in WordPerfect's Speller dialog box to tell the program to watch for duplicate words (such as "and and") and ignore words containing numbers.

POWERBOOK ANGLE

Fine-Tuning Memory and Disk Space

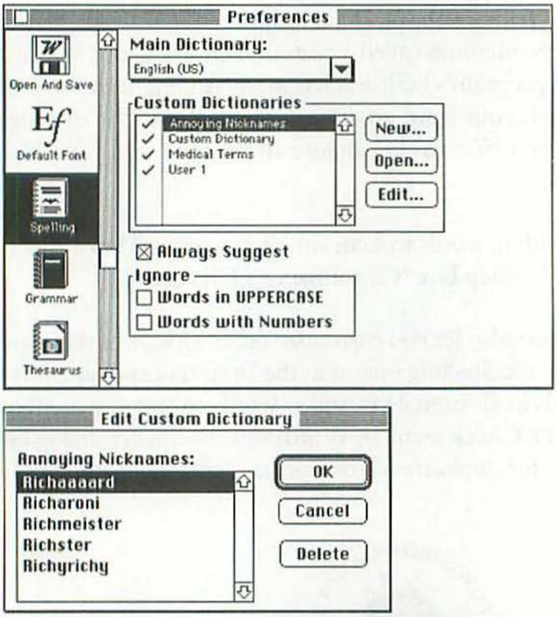
Free memory and disk space are often in short supply on a PowerBook. If you're willing to forgo some performance and features, you can dramatically reduce your program's appetite for kilobytes.

To reduce any program's memory requirements, select its icon at the Finder and choose Get Info from the File menu. In the Get Info window, specify how much memory you want to give the program by typing the value in the Current Size box. (In system versions prior to 7.0, this box reads Application Memory Size. In System 7.1, it reads Preferred Size.) I'll provide some memory-size guidelines shortly. For more details on tweaking program memory sizes, see Chapter 23.

Word 5 runs in as little as 512K of memory, although performance suffers and the grammar checker won't work. You may also encounter low-memory messages during a lengthy search-and-replace operation or when compiling an index or table of contents. As for saving disk space, Word 5's modular design makes pruning the program easy. Simply drag any modules and converters you don't want out of the Word Commands folder (located in the Word folder). The grammar checker is one candidate for the Trash; it and its accompanying file use nearly a megabyte of disk space.

WordPerfect 2 runs in as little as 800K of memory, but like Word, it slows down. To save disk space, delete file converters you don't need by dragging them out of the Conversions folder. To access the Conversions folder, open the System Folder; then the Preferences folder; then the WordPerfect folder.

Reducing disk space requirements means doing without. Remove files corresponding to features you don't use, such as sample documents, tutorials, and unneeded *converters* that enable your program to swap documents with other programs.



Main Dictionary: English (US)

Custom Dictionaries
✓ Annoying Nicknames
✓ Custom Dictionary
✓ Medical Terms
✓ User 1

☒ Always Suggest

Ignore
☐ Words in UPPERCASE
☐ Words with Numbers

Annoying Nicknames:
Richaaaard
Richaroni
Richmeister
Richster
Richyrichy

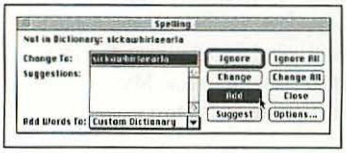
Figure 3-1: Editing Dictionaries In Word 5, you can switch between custom dictionaries using the Spelling option in the Preferences dialog box (top). Check marks indicate open dictionaries. When adding a large number of words to a dictionary, uncheck the Always Suggest option; that way, Word won't waste time looking up alternative spellings. Selecting a dictionary and then clicking Edit displays the dialog box (bottom) where you can remove words.

Word 5 can work with numerous custom dictionaries at once; consider creating separate dictionaries for different types of terms — legal terms, names, and so on. Use the Spelling option in the Preferences dialog box to switch between and edit custom dictionaries (see Figure 3-1 "Editing Dictionaries"). While the Preferences dialog box is open, explore its other options — they let you tailor over 50 aspects of Word's operation. WordPerfect's Preferences submenu, in the File menu, is also rich in customizing opportunities.

If you work in the legal or medical professions or with languages other than English, you may consider buying a specialized spelling checker dictionary. For Word 5, Alki Software's Comprehensive Proofing Tools series includes a custom dictionary containing 74,100 medical, legal, and business terms. Alki Software also sells the dictionaries Microsoft ships in countries other than the United States. WordPerfect Corporation sells a variety of dictionaries as well.

Customizing a Dictionary

Adding terms to a user dictionary essentially expands your word processor's vocabulary to include specialized terms you may use. This section shows you how to add a highlighted word to a Word or WordPerfect user dictionary.



Not in Dictionary: sickawhirleearla

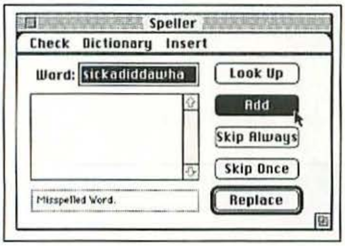
Change To: sickawhirleearla

Suggestions:

Add Words To: Custom Dictionary

To add a word in Word 5:

1. **Optional: To add a word to a specific custom dictionary, select the dictionary's name from the Add Words To pop-up menu.**
   If you don't perform this step, the word is added to the dictionary named Custom Dictionary.
2. **Click the Add button in the Spelling dialog box.**



Word: sickadiddawha

Misspelled Word.

To add a word in WordPerfect 2:

1. **Click the Add button in the Speller dialog box.**
   To edit the user dictionary, use the ST Utility program that comes with WordPerfect 2.1. (If you're still using WordPerfect 2.0, choose Open, select the All option from the Show pop-up menu, and then double-click the file named USA-User Dictionary.)

Creating Your Own Stationery

If you always create similar types of documents — memos, letters, fax cover sheets, contracts — create stationery for them. A stationery document is electronically preprinted with whatever text, graphics, and formatting information you use in a certain kind of document — just as a piece of company stationery is preprinted with a name and address. Stationery for a letter may contain your return address. Stationery for a newsletter may contain the publication name, placeholder text for the headlines and table of contents, and formatting settings for multicolumn pages.

Using a stationery document is easy: simply open it and start writing. Couldn't you simply open an old newsletter or memo and replace its contents? Yes, but you might accidentally choose Save instead of Save As, thereby losing the old document. By contrast, your word processor will open the stationery document as a new, untitled document, so you can't accidentally save over it.

QUICK TIPS

Stretching Text for Special Effects

Word, WordPerfect, and integrated programs such as ClarisWorks provide drawing features that let you create simple drawings without having to use a separate drawing program. If you use TrueType fonts or Adobe's Adobe Type Manager (ATM) utility (both described in later chapters), you can use these drawing features to create special text effects. Simply create the text using the drawing window's text tool, and then stretch or squeeze the resulting text as you see fit. The text may look a bit ragged on-screen, but it will print smoothly.

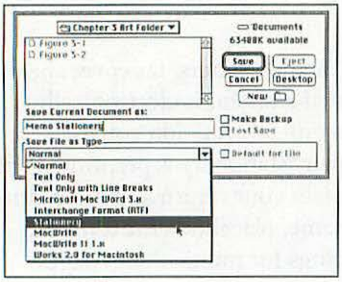
If you use Word and you've already typed some text in the document window, you can convert it into a picture by selecting it and then pressing ⌘-Option-D. This puts the text "picture" on the Mac's Clipboard. Choose Paste to insert the text in your document.

You'll find instructions for creating stationery in the Step-by-Step box "Creating Stationery."

STEP-BY-STEP

Creating Stationery

The following instructions are for Word and WordPerfect, but these basic steps apply to any program that supports stationery.



Save Current Document as: Memo Stationery

1. **Create the text and graphics and/or specify the desired margin and formatting settings.**
2. **Choose Save As from the File menu.**
3. **In Word, choose the Stationery option from the Save File As Type pop-up menu. In WordPerfect, choose WordPerfect Stationery from the Format pop-up menu.**

   If you're using a program other than Word or WordPerfect, look for a File Format button or pop-up menu that provides a stationery option. If you can't find one, your program may not support stationery. If you use System 7, you can still create a stationery document by using the Finder; see the Quick Tips box "Customizing Other Programs" for details.
4. **Type a name and then click Save.**

Cutting Down on Typing with Glossaries

Chances are you frequently use certain terms or sections of text — a return address, a closing for a letter, tendon-tangling scientific terms, contract clauses. Instead of typing them over and over again, store them as entries in a Word *glossary* file. A glossary entry can contain any amount of text, from a single character to an entire document, including graphics such as a company logo or a scanned version of your signature. You can insert a glossary entry into a document with a few keystrokes.

A single glossary file can contain as many entries as will fit on disk. You can also create any number of glossary files and switch between them. You may create separate glossaries for separate jobs — one for letters, one for contracts, one for technical manuals.

QUICK TIPS

Shortcuts for Moving Text in Word

Microsoft Word provides a couple of clever keyboard shortcuts that let you move or copy text without replacing the contents of the Clipboard. As this Quick Tips box describes, one shortcut relies on the keyboard, the other depends on the mouse.

Moving text with the keyboard

First, select the text and/or graphics you want to move, and then press ⌘-Option-X. In the page number area, Word displays the message *Move To.* Next, move the insertion point — notice it's a dotted bar instead of a solid blinking one — to the location you want the text to appear (or select a range of text to be replaced). Finally, press Return. To copy text instead of moving it, use ⌘-Option-C. To cancel the move or copy operation, press Esc or ⌘-period.

If you find that the preceding ⌘-Option-letter keystroke sequence twists your fingers into knots, you can use the Commands command (in the Tools menu) to reassign it to something a little easier — to one of the function keys on an extended keyboard, perhaps, or to one of the numbers on the numeric keypad.

Drag-and-drop editing

Word's drag-and-drop editing feature lets you move text (or graphics, for that matter) by simply dragging it to the desired location. To activate drag-and-drop editing, choose Preferences from the Tools menu and then check the Drag-and-Drop Text Editing box.

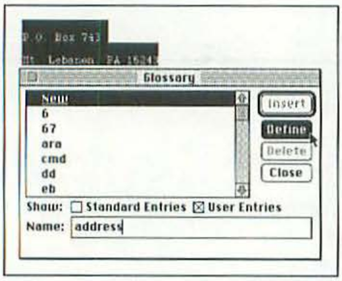
To drag text elsewhere within a document, simply select the text and then point to it. The mouse pointer turns into a left-pointing arrow. Press and hold down the mouse button, and then drag. As you drag, you'll see a dotted vertical bar follows the mouse pointer. Drag the bar until it's located where you want the text to appear, release the mouse button, and Word moves the text to that location. That's all there is to it.

You can't drag-and-drop text from one window to another. When you need to move text from one document to another, use the Edit menu commands or the ⌘-Option-X shortcut described in the previous tip.

The Step-by-Step box "Working with Glossaries in Word" shows you how to use Word's glossary features. WordPerfect lacks these features, but you can obtain the same keystroke-saving benefits by creating a macro — a series of keystrokes and/or menu choices that you record and save for later playback. See the section on macros later in this chapter.

Working with Glossaries in Word

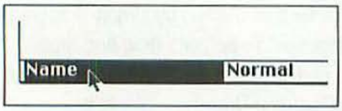
Glossaries cut down on repetitive typing by allowing you to store and recall often-used text. Here's how to work with glossaries in Word.



Name: address

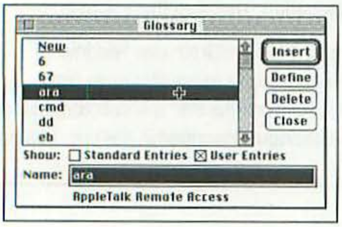
To create a glossary entry:

1. **Select the text and/or graphics that you want to store.**
2. **Choose Glossary from the Edit menu.**
   The Glossary dialog box appears.
3. **In the Name box, type a short name for the entry.**
   If you're creating an entry for your name, for example, you might type your initials.
4. **Click Define.**



To insert a glossary entry in a document:

1. **Position the blinking insertion point in the location you want the entry to appear.**
2. **Press ⌘-Backspace.**
   The word *Name* appears in the lower-left corner of the document window.
3. **Type the entry's name, and then press Return.**
   As an alternative to these steps, you can choose the Glossary command, select the entry, and then click Insert.



Name: ara

AppleTalk Remote Access

To add a glossary entry to the Work menu:

1. **Choose Glossary from the Edit menu.**
2. **Press ⌘-Option-equals.**
   The mouse pointer turns into a plus sign (+).
3. **Click the entry's name.**
   The menu bar flashes and the entry is added to the Work menu.

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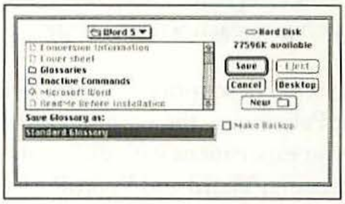


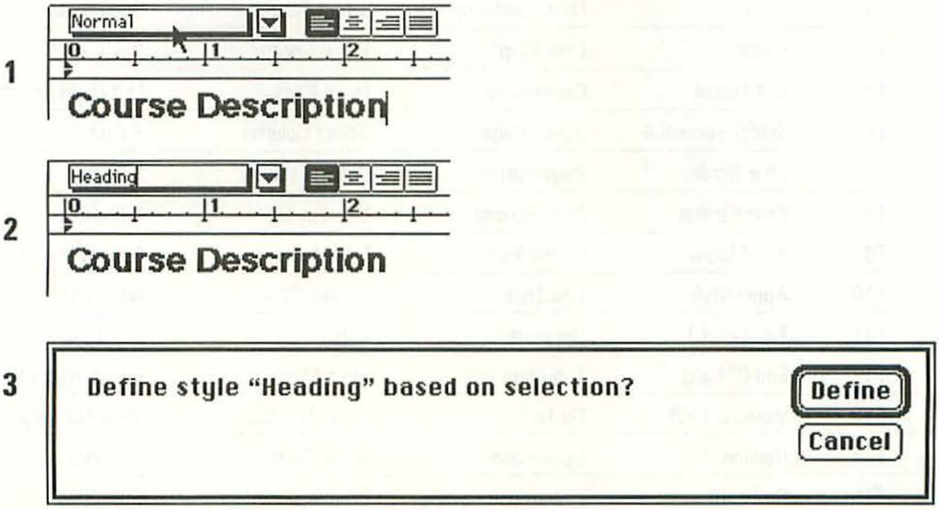
Save Glossary as: Standard Glossary

To save or open a glossary file:

1. **Choose Glossary from the Edit menu.**
2. **Choose the Save command to save the glossary, or the Open command to open a different glossary.**
   If you want the glossary entries to be available each time you start Word, name the glossary *Standard Glossary.* If you save the glossary file under a different name, you have to open it using the steps just described in order for the entries to be available.

Automate Formatting with Styles

If you frequently switch between text formats within a document, you should be using styles. A style is a set of text formats — font, size, type style, line spacing, and so on — that you can apply in one fell swoop. For example, say you always format reports to have double-spaced 14-point Helvetica Bold headings and single-spaced 10-point Times body text. If you define a style for a heading (see Figure 3-2 "Formatting with Style") or body text, you can format these elements with a single mouse click or keystroke — no traveling from menu to menu and threading through dialog boxes.



Define style "Heading" based on selection?

Figure 3-2: Formatting with Style To create a style in Word, format some text and then click within the ruler's Style pop-up menu (1). Type a name for the style (2), and then click Define (3). You can then apply the style to a different paragraph by selecting the paragraph and choosing the style from the ruler's pop-up menu.

Besides saving time, styles help ensure consistent formatting. This can be especially valuable for projects involving numerous writers. You can create a stationery document containing the styles used in a project, and then give each writer a copy.

Styles have additional advantages. If you change a style's description — perhaps to switch from 10-point Times body text to 12-point Palatino — the program reformats all text formatted under that style. This lets you experiment with different formatting options without a lot of manual reformatting. Word and WordPerfect

QUICK TIPS

A WordPerfect Cheat Sheet

If you have an extended keyboard — the big beast with the row of 15 function keys across the top — you can use it along with the Option, Shift, and ⌘ keys to choose a wide variety of commands, as shown in the following table.

Function Key Shortcuts

Key	*By Itself*	*With Option*	*With Shift*	*With ⌘*
F1	Undo	Show ¶	Move Together	New Graphic
F2	Cut	Show Codes	Move Apart	New Text Box
F3	Copy	Document Info	Smart Quotes	Copy Ruler
F4	Paste	Char Map	Paste Special	Paste Text
F5	Left Indent	Center Line	Flush Right	Left-Right Indent
F6	Select Sentence	Select Page	Select Column	Select ¶
F7	Char Border	Page Border	Column Border	¶ Border
F8	Char Format	Page Format	Line Format	¶ Format
F9	Run Macro	Center Page	Edit Macro	Record Macro
F10	Apply Style	Edit Style	Update Style	New Style
F11	ToC Level 1	Generate	Index	ToC Level 2
F12	End Of Field	Tab Align	Start Merge	End Of Record
F13	View At 100%	Go To	View At 200%	View Full Page
F14	Redline	Uppercase	Small Caps	Superscript
F15	Strikeout	Lowercase	Double Underline	Subscript

styles are also supported by publishing programs such as Aldus PageMaker and QuarkXPress. You can import a Word or WordPerfect document into either of these programs and retain the original style definitions and formatting.

Both Word and WordPerfect also let you link one style to another so that the program automatically switches from one style to the next when you press Return (or, in WordPerfect, Enter). For example, if you link your heading style to the body text style, the program automatically switches to the body text style after you type a heading. Both programs also let you base one style on another. If, for example, you're creating two styles that use the same line-spacing settings but different fonts, you can base the second style on the first. If you want to change line-spacing settings later on, you need alter only the first style.

The next chapter is devoted to the wonderful world of styles, and contains step-by-step instructions on creating and working with styles in Word, WordPerfect, and WriteNow.

Tailoring Keyboard Shortcuts and Menus

You can customize your word processor with keyboard shortcuts and menus. Word lets you change its keyboard shortcuts and even reorganize commands within its menus. If you never use the commands related to footnoting and indexing, for example, you can remove them to tidy up your menus.

Better still, you can add commands that correspond to options within Word's dialog boxes. For example, Word's Table Layout command lets you change, add, and delete rows, columns, and cells in tables created with Word's table editor. But when you're performing major surgery on a table, choosing Table Layout over and over again gets old quickly. The solution: Add the Table Layout dialog box's options to Word's menus, where you can choose them directly.

Word provides a special optional menu, called Work, that can hold the names of often-used documents, styles, and glossary files. You can add keyboard shortcuts to the Work menu's commands, giving you one-key access to the files, styles, and glossaries you use most (see Figure 3-3 "Put Word to Work" as well as the Step-by-Step box "Customizing Word and WordPerfect").

A Microsoft Word Cheat Sheet

No word processor offers more slick keyboard and mouse shortcuts than Microsoft Word. The following tables show just a few of the shortcuts Word provides.

Selection Shortcuts

To Select This...	*Do This...*
a word	double-click on the word
a sentence	⌘-click within the sentence
a paragraph	triple-click within the paragraph or double-click the selection bar adjacent to the paragraph
a single line	click once in the selection bar adjacent to the line
a carriage return character	double-click to the right of the last line of the paragraph
the entire document	⌘-click in the selection bar, or triple-click in the selection bar, or choose Select All from the Edit menu
a table column	press Option and then click anywhere within the column
an entire table	press Option and then double-click anywhere within the table
a table cell	click within the cell selection bar on the cell's left edge

Table-Editing Shortcuts

To Do This...	*Do This...*
delete a selected row or series of rows	press ⌘-Control-X
insert a row or series of rows	press ⌘-Control-V
insert a paragraph above the row containing the insertion point	press ⌘-Option-space bar
move a row	switch to Outline view and then drag the row
to insert a blank paragraph above a table	place the insertion point in the first row of the table and then press ⌘-Option-spacebar

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Outlining Shortcuts

To Do This...	*Press...*
promote the heading containing the insertion point	Option-left arrow
demote the heading containing the insertion point	Option-right arrow
move the paragraph containing the insertion point up	Option-up arrow
move the paragraph containing the insertion point down	Option-down arrow
expand or collapse an entire outline to a specific level	⌘-Option-T and then press 1, 2, 3, or 4
expand the heading containing the insertion point	Plus key (+) on the numeric keypad
collapse the heading containing the insertion point	Minus key (-) on the numeric keypad
expand an entire outline	Multiply key (*) on the numeric keypad

Character Formatting Shortcuts

For This Style...	*Press ⌘-Shift and...*
Bold	B
Italic	I
Underline	U
Word underline	] (closing bracket)
Double underline	[(opening bracket)
Dotted underline	\ (backslash)
~~Strikethru~~	/ (slash)
Outline	D
Shadow	W
SMALL CAPS	H
ALL CAPS	K
Hidden (appears as dotted underline)	X

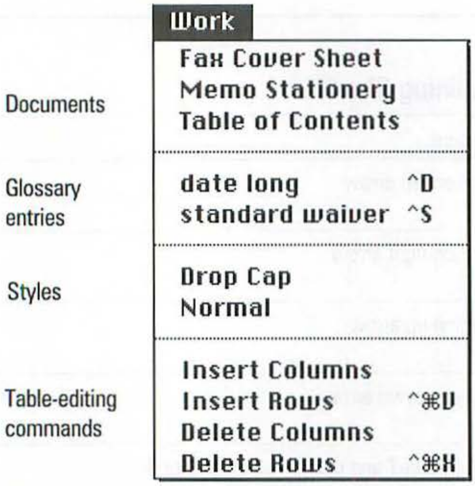


Figure 3-3: Put Word to Work Word's Work menu can hold the names of items you use frequently. To add a keyboard shortcut to a Work menu command, press Command and Option along with the plus sign on the numeric keypad. The pointer turns into a symbol. Choose the command to which you want to add a shortcut, and then type the key combination you want to assign to that command. Consider using Control-key sequences to avoid having to replace a built-in ⌘-key sequence. The Control key is indicated in menus by the caret symbol (^).

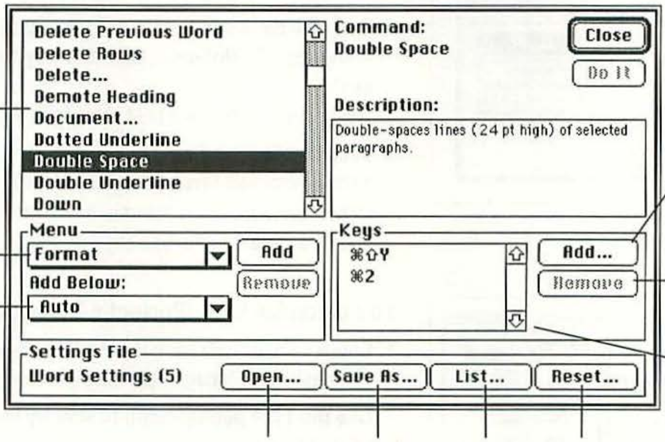
You can also use the Commands dialog box to add or remove commands to or from Word's other menus and to switch between settings files, which store your preferences, menu-arrangement, and keyboard-shortcut settings (see Figure 3-4 "Command Performance").

Like Word, WordPerfect lets you change and create keyboard shortcuts for menus and the style sheets and macros you create. Unlike Word, WordPerfect lets you reorganize the position of keyboard characters themselves. For example, if you use the trademark symbol (™) frequently, you may want to assign it to the Option-T key sequence instead of its usual (and more forgettable) Option-2 sequence.

Macros: WordPerfect on Autopilot

If you use WordPerfect and you frequently perform the same sequence of steps, consider recording those steps in a macro for later playback. Macros can perform simple jobs, such as inserting often-used text or automatically changing all double hyphens (--) to typesetter's em dashes (—). But a macro can also perform a sequence of events — opening a document, searching for some text and replacing it with something else, saving the document, and then printing it. You can even create macros that display dialog boxes and then make decisions based on your response. For example, you can create a form letter whose contents varies depending on whether a client's account is paid up or past due.

To record a macro in WordPerfect, choose Record from the Macro menu. Type a name for the macro and then click New. Next, perform the steps you want to record. If you need to scroll while recording, use the keyboard's scrolling keys, not



Command: Double Space

Description: Double-spaces lines (24 pt high) of selected paragraphs.

Menu: Format

Add Below: Auto

Keys: ⌘⇧Y, ⌘2

Settings File: Word Settings (5)

All commands and options that can be added to menus appear here.

Choose the name of the menu where you want the command to appear.

Use this pop-up menu to specify where the command should appear within the menu.

Add a keyboard shortcut.

Remove the selected keyboard shortcut.

Keyboard shortcuts for the selected command.

Open a settings file.

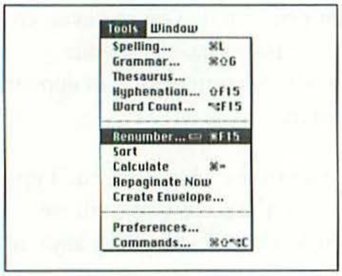
Save the current settings.

List the current keyboard and menu settings.

Reset the command settings to Microsoft defaults or to the last-saved settings.

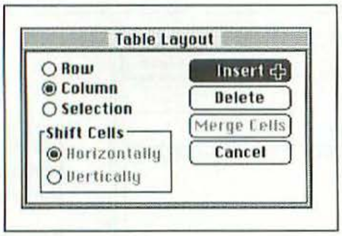
Figure 3-4: Command Performance Word's Commands dialog box is the gateway to modifying the program's menus to your own specifications.

Customizing Word and WordPerfect



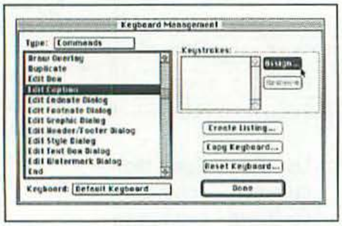
To remove a command from Word's menus:

1. **Press ⌘-Option-hyphen (the key to the right of the zero key).**
   The mouse pointer turns into a bold minus sign (-).
2. **Choose the command you want to remove.**
   The menu bar flashes and the command is removed. You can restore the command later by using the Commands dialog box.



To add a Word dialog box option to a menu:

1. **Open the dialog box containing the option you want to add and then press ⌘-Option-equals (the key to the left of the Delete key).**
   The pointer turns into a bold plus sign (+).
2. **Click the desired dialog box option.**
   If the pointer remains a bold plus sign, the option you clicked lacks a corresponding command. To restore the normal pointer, press ⌘-period or the Esc key.



To customize WordPerfect's keyboard:

1. **Choose Keyboards from the Preferences submenu (File menu).**
   The Keyboard Management dialog box appears.
2. **Use the Type pop-up menu to specify how you want to modify the keyboard.**
   For example, choose Characters to change a keyboard character, Commands to assign or remove a keyboard shortcut, or Styles to assign a shortcut to a style.
3. **Select a character, menu command, style, or macro name, and use the Assign or Remove buttons to add or remove a keyboard shortcut.**
   WordPerfect keyboard settings are stored in a *keyboard template.* You can create as many keyboard templates as you like and switch between them using the Keyboard Management dialog box.

the mouse. When you've finished recording, choose Stop Recording from the Macro menu. (You can also pause recording — to perform an activity that you don't want to record — by choosing Pause from the Macro menu's Options submenu; choose Resume to continue recording.) When asked to save changes, click Yes.

Unless you say otherwise, WordPerfect stores macros in your private library; this file, located in your System Folder, can hold macros, styles, keyboard templates, and more. Items in the private library are available in any open document. If you want a macro (or a style, keyboard template, or other item) to be available only when a certain document is open, save it in that document.

Word 5 lacks a macro language, but a forthcoming version of Word will provide one called WordBASIC. (If you use Word for Windows on an IBM PC or clone, you can get a preview of what Word's macro language will be like.)

Spending Time Now Saves Time Later

Customizing a word processor is one of those jobs that takes some time at first but pays off in the long run. As you create dictionaries, styles, and stationery, tweak menus and keyboard shortcuts, and write macros, you'll tailor your program to your writing habits. You'll create a word processor that feels just right.

QUICK TIPS

Creating Reverse Type in Word

You can use the shading option in Word's Border dialog box to format a paragraph or part of a table in reverse type — white type on a black background.

To create reverse type, use the following steps:

1. **Select the paragraph or table cell, column, or row.**
2. **Choose Character from the Format menu.**
3. **Choose White from the Color pop-up menu.**
   This tells Word to format the selected characters in white.
4. **Click OK or press Return.**

   The text seems to disappear — that's because it's now white text on a white background. You'll fix this in the next steps. In the meantime, don't deselect the text.
5. **Choose Border from the Format menu.**

   The Border dialog box appears.
6. **Choose 100% from the Shading pop-up menu.**
   You can also type **100** in the Shading box.
7. **Click OK or press Return.**
   Word shades the paragraph or cell black, allowing the white text to appear.

CHAPTER 3 CONCEPTS AND TERMS

- You can save time and cut down on repetitive typing and formatting by mastering the customizing options your word processor provides.
- Adding words to a custom dictionary tailors your word processor's spelling checker to match the type of writing you do.
- If you create a certain type of document often, consider creating a stationery document for it that reflects its formatting and any boilerplate text.
- Style sheets let you automate and easily change complex formatting.
- One way to fine-tune a word processor for efficiency is by customizing its keyboard shortcuts — adding shortcuts to the commands you use most and changing any shortcuts you have trouble remembering.

converters
Special files that enable a program to swap documents with other programs.

glossary
A word processor feature that lets you store and recall often-used text and/or graphics with a single keystroke. In Word, glossary entries are saved in a special document called a glossary file.

keyboard template
A WordPerfect settings document that describes which key sequences summon which characters and commands.

private library
A special type of WordPerfect document, located in your System Folder, that stores macros, styles, keyboard templates, and more. Items in the private library are available in any open document.

settings file
In Microsoft Word, a special document that stores your Word preferences, including customized menus and key sequences. You can create any number of settings files and switch between them using the Tool menu's Commands command.

stationery
A special type of document that holds boilerplate text, graphics, and formatting. If you routinely create a certain type of document, save it as *stationery* to cut down repetitive formatting.

user dictionary
Sometimes called a *custom dictionary,* a file that supplements a program's built-in spelling checker dictionary.

CHAPTER FOUR

Fast Formatting with Style Sheets

IN THIS CHAPTER

- Using style sheets to automate formatting jobs
- Taking advantage of the speed, consistency, and ease that style sheets provide
- Creating and working with styles in Microsoft Word, WordPerfect, and WordStar's WriteNow

Writing is only part of what you do with a word processor. The other part is formatting — choosing fonts, adjusting margins, changing line spacing, setting tabs. It's the manual labor that can make you feel more like a typesetter than a writer.

What's frustrating about formatting is that so much of it is repetitive: 12-point Helvetica headings, 10-point Times body text, and back again. Maybe you also have an extra line space above the headings, or you center the headings over justified body text. Switching between these formats as you create a document means trip after trip to the menu bar and through the same old dialog boxes.

Or does it? Four of today's most popular word processors — Microsoft Word 5, WordPerfect 2, Claris' MacWrite Pro, and WordStar's WriteNow 3 — provide features that let you automate repetitive formatting chores by creating *style sheets,* or *styles* for short. If you've read the previous chapter, you know that a style is a collection of formatting settings — font, point size, line spacing, tabs, margins, borders, and more — stored under a single name, such as "heading" or "body text." If you create a style for centered 12-point bold Helvetica headings, you can turn any text into a heading with one mouse click or keystroke. Styles let you leap tall formatting tasks in a single bound.

Besides enabling you to quickly apply complex formats, styles make reformatting easier. If you decide your headings would look better in 14-point Bookman italic, just change the description of the heading style, and all headings are instantly changed — no need to scroll through the document and manually change each one. You can even tell your word processor to switch from one style to another when you end a paragraph.

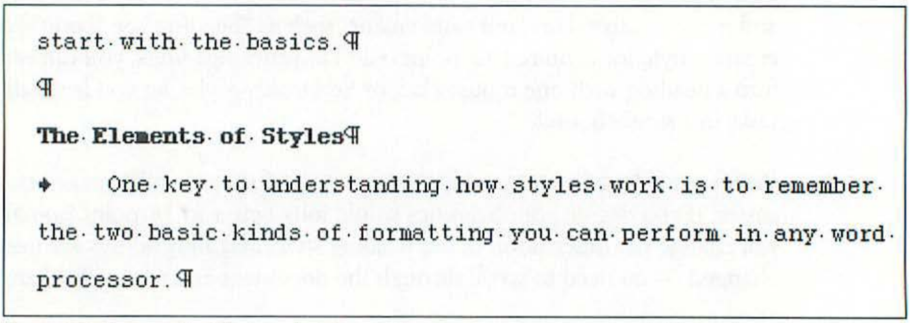
All this automation has another benefit. Styles help ensure that a long document has a consistent appearance, even if you redesign it in midstream.

As with any word processor customizing task, defining styles for a document is one of those jobs where some up-front work simplifies life in the long run. So why do so many people ignore their program's style features? One reason may be the initial set-up time — even a minute of advance planning is too much for some folks. But another reason may be that styles can seem complicated. They aren't, especially if you start with the basics.

The Elements of Styles

One key to understanding how styles work is to remember the two basic kinds of formatting you can perform in any word processor — character-level formatting and paragraph-level formatting. When you change an individual word from, say, bold to italic, you're formatting at the character level. When you change indents, tabs, or line spacing, you're formatting at the paragraph level. And remember, to a word processor, a paragraph is any piece of text — even a single letter — that is surrounded by carriage returns (see Figure 4-1 "Paragraphs Illustrated").

The basic style features in Microsoft Word, WordPerfect, MacWrite Pro, and WriteNow operate on the paragraph level; when you define a style in these programs, the style stores not only the desired font and type size, but also the line



```
start·with·the·basics.¶
¶
The·Elements·of·Styles¶
◆    One·key·to·understanding·how·styles·work·is·to·remember·
the·two·basic·kinds·of·formatting·you·can·perform·in·any·word·
processor.¶
```

Figure 4-1: Paragraphs Illustrated To a word processor, any text surrounded by carriage returns (generated by pressing Return) is a paragraph. There are four paragraphs here.

QUICK TIPS

Simulating Styles in Other Programs

If you use a program that doesn't provide style-sheet features — Microsoft Works, ClarisWorks, MacWrite II — you can simulate styles by using a keyboard customizing program such as CE Software's QuicKeys. With Microsoft Works, you can create macros to automate formatting. As Chapter 6 shows, the Microsoft Excel spreadsheet program has some slick style features of its own that let you automate the formatting and alignment of cells.

spacing, indents, tabs, and other formatting attributes that can apply to paragraphs. WriteNow and Claris MacWrite Pro also provide character-level styles that store only font, size, and type-style information. I'll spotlight some advantages of character-level styles later.

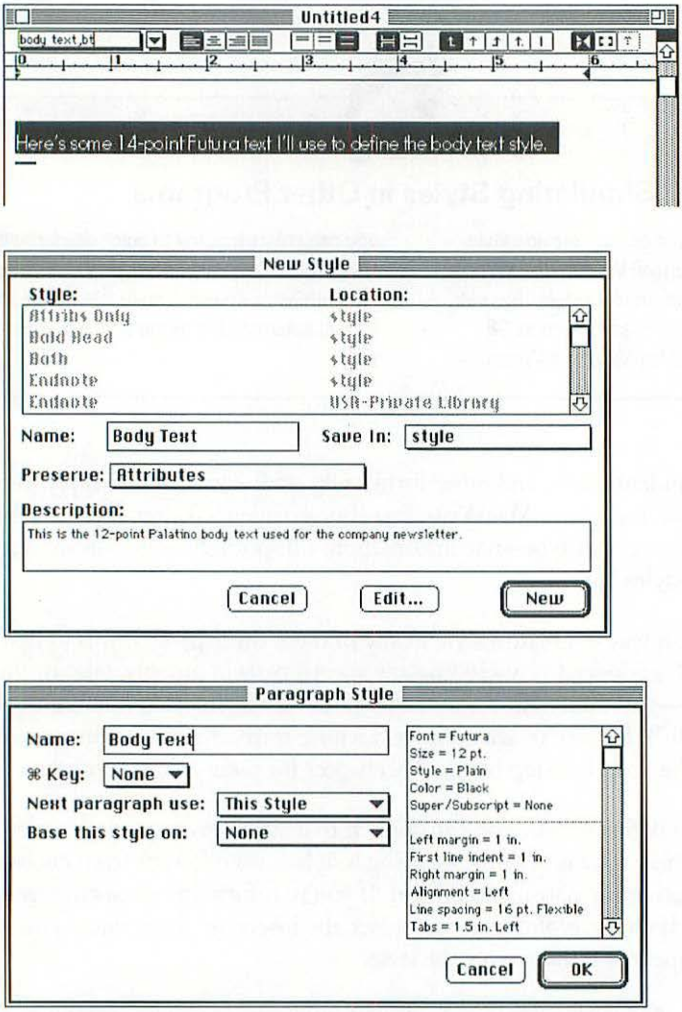
The easiest way to create a style in any of these three programs is to first format a paragraph as desired — including any special margin indents, tabs, or line spacing settings — and then define a style that holds the formatting (see Figure 4-2 "Creating a Style"). Be sure to select the text whose formatting you want to store. Then, consult the Step-by-Step box in this chapter for your specific program.

Once you define a style, you can apply it to existing text or to new text that you type. In these four programs, applying a style is no different from choosing a font or some other formatting command. If you're reformatting existing text, select the text first; if you're typing new text, place the insertion point where you want the text to appear and then apply the style.

For faster formatting, create a keyboard shortcut for a style or add it to a menu. The Step-by-Step boxes show how.

Advanced Style Techniques

Normally, when you press Return to begin a new paragraph, your word processor applies the current style to the new paragraph. But what if you frequently switch formatting from one paragraph to the next? In an instruction manual, you may alternate between bold step-by-step instructions to plain-text explanations of each step (see Figure 4-3 "Next Style"). In a newsletter or book, you may switch from headings in one font to body text in another.



body text,bt

Here's some 14-point Futura text I'll use to define the body text style.

Style:	Location:
Attribs Only	style
Bold Head	style
Both	style
Endnote	style
Endnote	USA-Private Library

Name: Body Text
Save In: style
Preserve: Attributes
Description: This is the 12-point Palatino body text used for the company newsletter.

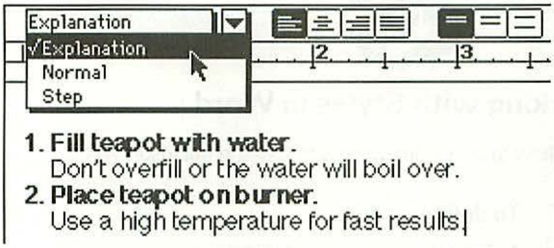
Name: Body Text
⌘ Key: None
Next paragraph use: This Style
Base this style on: None

Font = Futura
Size = 12 pt.
Style = Plain
Color = Black
Super/Subscript = None

Left margin = 1 in.
First line indent = 1 in.
Right margin = 1 in.
Alignment = Left
Line spacing = 16 pt. Flexible
Tabs = 1.5 in. Left

Figure 4-2: Creating a Style Click in the Word ruler's Style box (top), and then type a name for the style. You can add an optional abbreviation by typing a comma — handy when applying style names using the keyboard. WordPerfect's New Style dialog box (middle) lets you add an optional description to remind you of the style's purpose or revision history. WriteNow's Paragraph Style dialog box (bottom) lists the formatting attributes that make up the new style.

You can automatically switch to a different style when you end a paragraph by defining a next style (called a linked style in WordPerfect). This chapter's Step-by-Step boxes show you how to define a next style for a style that you've already created, but all four programs also let you specify a next style as you create a new style.



1. **Fill teapot with water.**
Don't overfill or the water will boil over.
2. **Place teapot on burner.**
Use a high temperature for fast results.

Figure 4-3: Next Style These instructions use two styles: *Step* and *Explanation.* Each step is linked to the other with the next-style option — pressing Return after typing a step automatically switches to the Explanation style.

In either case, before defining a next style, first create the style that you'll be switching to — you can't specify a next style if the next style doesn't yet exist.

When defining styles, you can base numerous styles on one base style that reflects the bulk of the formatting information. A well-designed document may have many different elements — headings, body text, sidebars, tables — but most elements share some common formatting. You may, for example, use Palatino Bold for headings and plain Palatino for body text, headers, and footers. If you need to do a major redesign — maybe the boss wants the Futura font family instead of Palatino — you can simply change the base style.

All four programs provide a base style that they apply to text unless you specify a different style. In Word and WordPerfect, this base style is called *Normal.* In WriteNow, it's called *Body Style.* In MacWrite Pro, it's called *Default.* All four programs also provide predefined styles for headers, footers, footnotes, and other parts of a document. In Word, MacWrite Pro, and WriteNow, these predefined styles are based on the Normal, Default, or Body Text styles, respectively. By modifying those base styles, you can change the appearance of headers, footers, and other elements, too.

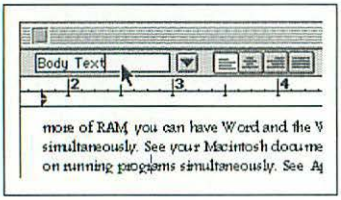
You don't have to base a style on the Normal or Body Style style — you can base a style on a custom style that you create. You might create a base style named "Newsletter" and then create your own header, footer, and caption styles that are based on the Newsletter style.

The Step-by-Step boxes in this chapter show you how to create next styles and work with base styles.

STEP-BY-STEP

Working with Styles in Word

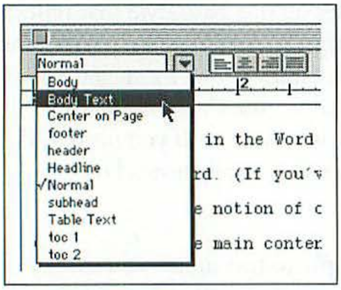
This box shows you how to create and work with styles in Microsoft Word.



more of RAM, you can have Word and the V
simultaneously. See your Macintosh docume
on running programs simultaneously. See A

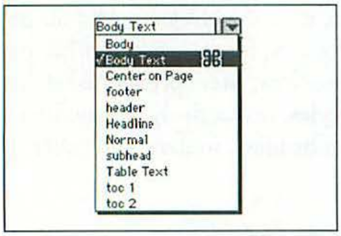
To define a style:

1. **Format some text as desired.**
2. **Display the ruler.**
   Choose Ruler from the View menu or press ⌘-R.
3. **With the blinking insertion point within the text, click once within the ruler's Style pop-up menu.**
4. **Type a name for the style and then press Return.**
   Word asks if you want to define the style based on the selection.
5. **Click Define.**



To apply the style to another paragraph:

1. **Place the insertion point within the paragraph and then choose the style's name from the ruler's pop-up menu.**
   If you don't want to display or travel up to the ruler, use this keyboard shortcut: Press ⌘-Shift-S, type part or all of the style's name, and then press Return.



To create a keyboard shortcut for a style:

1. **Be sure the ruler is visible.**
2. **Press ⌘-Option-plus. (That's the plus on the number keypad, not the one next to the Delete key.)**
   The mouse pointer turns into a Command (⌘) symbol. (If your keyboard lacks a number keypad, choose Commands from the Tools menu, select the Assign to Key command, and then click Do It.)
3. **Choose the desired style from the ruler's Style pop-up menu.**
   Word asks you to type the keystroke you want to use to summon that style.
4. **Type the keystroke, using the ⌘ key along with any other desired modifier keys (Control, Option, Shift).**
   If the keystroke you typed is already assigned to a different command, Word asks if you want to reassign it. Click OK if you do; otherwise, click Cancel and think up a different keystroke.

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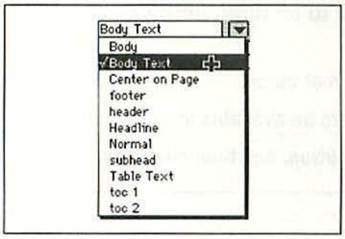
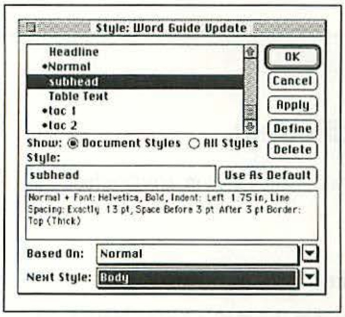


To add a style to Word's Work menu:

1. **Press ⌘-Option-plus (use the plus key next to the Delete key).**
2. **Choose the desired style from the ruler's Style pop-up menu.**



Style: subhead

Normal + Font: Helvetica, Bold, Indent: Left 1.75 in, Line Spacing: Exactly 13 pt, Space Before 3 pt After 3 pt Border: Top (Thick)

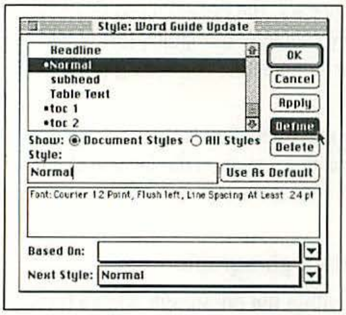
Based On: Normal

Next Style: Body

To define a next style:

1. **Choose Style from the Format menu.**
2. **Select the style for which you want to define a next style.**
3. **Use the Next Style pop-up menu to choose the style you want to switch to.**
4. **Click Define; then click Close.**

   If you want to override the next style, press ⌘-Return to start a new paragraph. When you press ⌘-Return, Word applies the current style to the new paragraph instead of switching to the next style.



Style: Normal

Font: Courier 12 Point, Flush left, Line Spacing At Least 24 pt

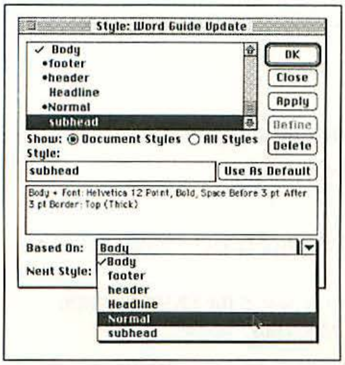
Based On:

Next Style: Normal

To redefine the Normal style:

1. **Choose Style from the Format menu.**
2. **Select the Normal style.**
3. **Use the ruler or the commands in the Font and Format menus to change the formatting as desired.**
4. **Click Define.**
5. **Optional: If you want this Normal style to be used in all new, untitled documents, click the Use As Default button and then click Yes.**

   If you don't perform this step, the changes you made to the Normal style will apply to the currently active document only.



Style: subhead

Body + Font: Helvetica 12 Point, Bold, Space Before 3 pt After 3 pt Border: Top (Thick)

Based On: Body

Next Style:

To change the style upon which another style is based:

1. **Choose Style and then select the style you want to change.**
2. **Choose the desired base style from the Based On pop-up menu, and then click Define.**

   In Word, all styles are based on the Normal style unless you specify otherwise.

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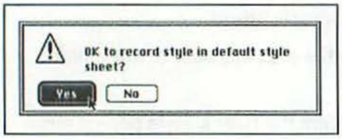


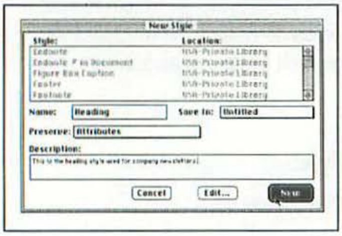
To make a style available to all new, untitled documents:

1. **Choose Style from the Format menu.**
2. **Select the style you want to be available in all documents.**
3. **Click the Use As Default button, and then click Yes.**

STEP-BY-STEP

Working with Styles in WordPerfect

In this Step-by-Step box, you'll find instructions for creating and managing styles in WordPerfect.



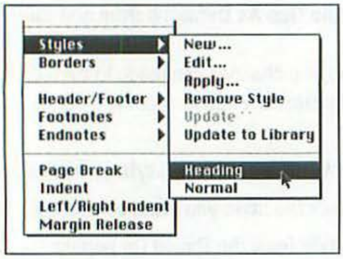
Name: Heading
Save In: Untitled
Preserve: Attributes
Description: This is the heading style used for company newsletters

To create a style:

1. **Format some text as desired.**
2. **With the insertion point within the text, choose New from the Layout menu's Styles submenu.**

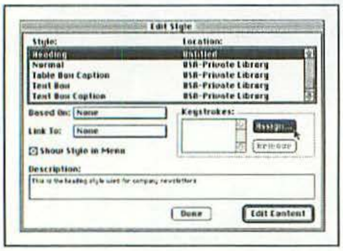
   The New Style dialog box appears. The Preserve pop-up menu lets you choose to store only character formatting (the preset Attributes option), only ruler settings (the Formatting option), or both.
3. **Type a name for the style and then click New.**

   You can also type an optional description to remind you of the style's purpose.



To apply the style to another paragraph:

1. **Place the insertion point within the paragraph whose formatting you want to change.**
2. **Choose the style's name from the Styles submenu.**



Based On: None
Link To: None
☒ Show Style in Menu
Description: This is the heading style used for company newsletters

To create a keyboard shortcut for a style:

1. **Choose Edit from the Styles submenu.**
2. **Select the desired style.**
3. **In the Keystrokes area, click the Assign button and then type the keystroke.**

   If you don't want the style to appear in the Styles submenu, uncheck the Show Style in Menu box.
4. **When you've finished defining shortcuts, click Done.**

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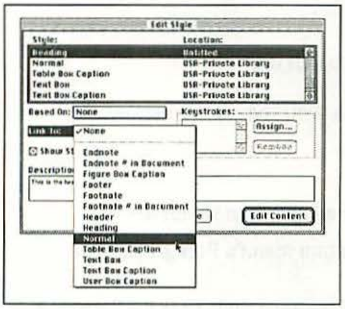
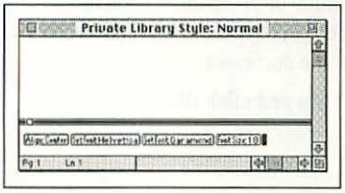


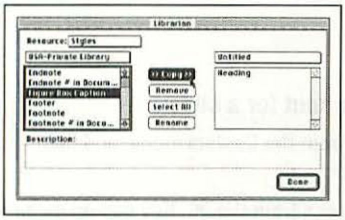
To define a next style (a linked style):

1. **Choose Edit from the Styles submenu in the Layout menu.**
2. **Select the style for which you want to define a next style.**
3. **Choose the next style from the Link To pop-up menu, and then click Done.**
   Unlike Word and WriteNow, WordPerfect doesn't switch to the next style when you press Return. To call up the next style, end a paragraph by pressing Enter instead.



To redefine the Normal style:

1. **Choose Edit from the Styles submenu (Layout menu).**
2. **Double-click the Normal style.**
3. **Specify the desired formatting, and then close the Normal style window.**
   If you want to base the header, footer, footnote, and other element styles on the Normal style, edit each style and choose Normal from the Based On pop-up menu.



To make a style available to all documents:

1. **Choose Librarian from the File menu.**
2. **Choose Styles from the Resource pop-up menu.**
3. **Select the style you want to copy; then click Copy.**
4. **Click Done or press Return.**

Redefining a Style

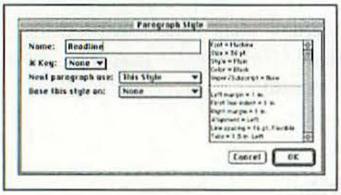
One advantage of styles is that they let you redesign a document in one swoop. The instructions in this chapter's Step-by-Step boxes show you how to redefine the Normal or Body Text styles. You can use these same steps to redefine a style that you've created.

You can also use these steps to redefine a program's built-in styles, such as its header, footer, or footnote style. In WriteNow and WordPerfect, these styles automatically appear in the style-editing dialog box. In Word, however, they don't automatically appear. To display Word's *standard styles,* click the All Styles button in the Styles dialog box. When you do, you see a list of nearly 30 predefined styles. Some control the appearance of headings created in Word's outline view; others govern the formatting of index and table of contents entries. All of these standard styles are based on the Normal style.

STEP-BY-STEP

Working with Styles in WriteNow

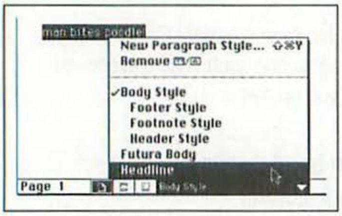
The instructions in this box show you how to create and work with styles in WriteNow.



Name: Headline
⌘ Key: None
Next paragraph use: This Style
Base this style on: None

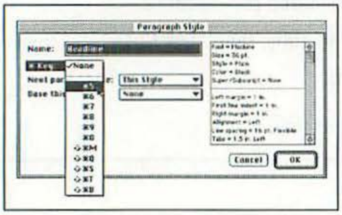
To create a style:

1. **Format some text as desired and then select it.**
2. **Choose New from the Custom menu's Paragraph Style submenu.**
   You can also choose New Paragraph Style from the Paragraph Style pop-up menu at the bottom of WriteNow's document window. This pop-up menu doesn't appear unless you've already defined at least one style for the document.
3. **Type a name for the new style and click OK.**



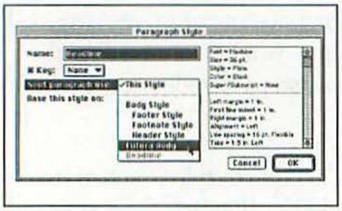
To apply a style:

1. **If you're reformatting existing text, select the text to which you want to apply the style.**
2. **Choose the desired style from the Paragraph Style pop-up menu.**



To define a keyboard shortcut for a style:

1. **Choose Edit/Delete Style from the Custom menu, and then double-click the desired style.**
2. **Choose the desired keystroke from the ⌘ Key pop-up menu.**
   WriteNow doesn't let you make up your own keystroke sequence as a style shortcut, but instead provides 11 predefined Command-key sequences from which to choose.
3. **Click OK.**



To define a next style:

1. **Choose Edit/Delete Style from the Custom menu.**
2. **Double-click the style for which you want to define a next style.**
3. **Choose the desired next style from the Next paragraph use pop-up menu, and then click OK.**
   To override the next style when ending a paragraph, press Option-Return instead of Return.

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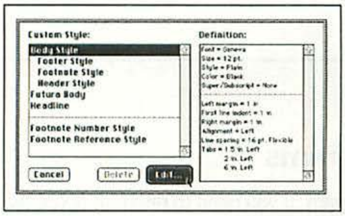
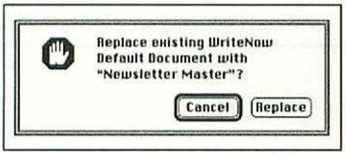


Font = Geneva
Size = 12 pt.
Style = Plain
Color = Black
Super/Subscript = None

Left margin = 1 in.
First line indent = 1 in.
Right margin = 1 in.
Alignment = Left
Line spacing = 16 pt. Flexible
Tabs = 1.5 in. Left
2 in. Left
6 in. Left

To redefine the body text style:

1. **Choose Edit/Delete Style from the Custom menu.**
2. **Double-click the style named Body Style.**
   You can also select the style and then click Edit.
3. **Use the ruler or the Font, Size, and Style menus to change formatting, and then click OK.**
   To base a new style on the body text style, choose Body Style from the Base this style on pop-up menu when creating the new style.



Replace existing WriteNow Default Document with "Newsletter Master"?

To make custom styles available in all new, untitled documents:

1. **Save the document to make sure your latest changes are committed to disk.**
2. **Delete all of the text in the document, including that of headers and footers (unless you want that text to appear in all new, untitled documents).**
3. **Choose Save As Default Document from the File menu and then click Replace.**
4. **If you want to restore the document's text to continue working on it, choose Revert to Saved from the File menu. Otherwise, close the document and then click Don't Save.**

Making a Style Available in All Documents

When you define a new style, it's available only in the document that was active when you created the style. But as this chapter's Step-by-Step boxes show, it's easy to change that and make one or more of your custom styles available in the new, untitled documents you create.

Word and WriteNow provide other ways to move styles from one document to another. In Word, you can access the styles in a different document by choosing Open from the File menu while the Style dialog box is open. You can also copy a style by simply copying a paragraph formatted with that style, and then pasting it into another document. Alternatively, you can do it by copying the last paragraph mark (the ¶ symbol visible when you choose Show ¶) in a document and pasting that into the new document. In WriteNow, you can use the Custom menu's Import Styles command to access another document's styles. All four programs also let you create stationery documents that store styles and other often-used elements.

QUICK TIPS

Styles and Publishing Programs

Publishing programs such as Aldus PageMaker and QuarkXPress can interpret the styles you've defined in your word processor. This means you can do text formatting with your word processor and then bring that text — and its styles — into the publishing program. If you need to reformat text after importing it into the publishing program, you can redefine the appropriate styles right there in the publishing program.

Overriding a Style

You can override a style you've applied by using your program's formatting features in the conventional way. Each program has its own way of indicating that you've overridden a style with manual formatting (see Figure 4-4 "Overriding Styles").

When would you override a style? One common reason would be to apply additional character formatting — to italicize a word in a sentence. Another reason might be to change paragraph formatting — to center a paragraph instead of justify it.

Try to avoid extensive overriding; it defeats the purpose of styles. If you find yourself frequently overriding a style in the same way, consider creating another style that's based on the style you've been overriding.

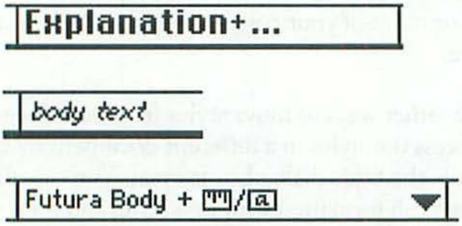


Figure 4-4: Overriding Styles Each program tells you when you've overriden a style with manual formatting: Word's plus sign and ellipsis (top), WordPerfect's italicized style name (middle), and WriteNow's plus sign plus ruler- and character-formatting icons (bottom).

The character-level styles that WriteNow and MacWrite Pro provide can also eliminate the need to override a style in order to apply additional character formatting. For example, if you always italicize the first occurrence of a technical term, you might create a character style that reflects this formatting. (Another word processor, Nisus Software's Nisus, also provides character-level styles.)

Becoming Style Conscious

Okay, styles can seem complicated, especially when you start wading through next-style and based-on options. But you don't have to start out in these backwaters. Start by creating some simple styles for the types of documents you create. For your correspondence, define a return-address style that automatically indents your address and closing. For a newsletter or manual, define styles that automatically format your headings and body text.

Try redefining the Normal or Body Text style so that you don't have to change fonts, tabs, or margins every time you create a new document. Become style conscious. You'll cut down on repetitive formatting and have more time to refine your writing. Isn't that why you use a word processor to begin with?

CHAPTER 4 CONCEPTS AND TERMS

- Style sheets, or styles, let you automate complex formatting.
- Most programs provide a base style named Normal or Body Text upon which new styles are based unless you specify a different base style.
- Most word processors provide standard styles for common document components — headers, footers, tables of contents, footnotes, and more. By redefining the standard styles, you can control how these components appear.
- If you routinely switch from one style to another, use your word processor's next-style or linked style feature to automate the process.
- Publishing programs such as Aldus PageMaker and QuarkXPress can interpret the styles you create in a word processor.

base style
A style upon which other styles are based. In Word and WordPerfect, this base style is called *Normal.* In WriteNow, it's called *Body Style.* In MacWrite Pro, it's called *Default.*

next style
A style that a word processor automatically switches to when you end a paragraph. This is called a *linked style* in WordPerfect.

standard styles
Built-in styles that control the formatting of common document components, such as headers, footers, page numbers, and footnotes.

style
A named set of text formats — font, size, type style, line spacing, and so on — that you can apply with a single keystroke or menu choice.

CHAPTER FIVE

Spreadsheet Basics

IN THIS CHAPTER

- Exploring approaches to problems with spreadsheets
- Using mathematical functions
- Formatting and designing spreadsheets
- Managing and navigating large spreadsheets
- Including spreadsheet data in other programs

The spreadsheet has been around in one form or another for centuries. In the 1800s, spreadsheets were big, leather-bound books — the kind Cratchet scratched his quill in. In this century, leather gave way to leatherette, and Cratchet evolved into a paunchy guy in baggy pants who played a mechanical adding machine like a Stradivarius.

For years the spreadsheet remained essentially the same: a large ledger with pages divided into rows and columns for convenient organization of text and numbers. Then in the late '70s, a Harvard MBA candidate named Dan Bricklin got the idea that a computer program could mimic a ledger and also calculate numbers. His finance professor dismissed the idea as having no commercial value, but Bricklin was undaunted, and teamed up with programmer Bob Frankston to create a wildly successful program called VisiCalc. The electronic spreadsheet was born, and the skeptical professor joined the ranks of history's great antivisionaries.

Since then, the spreadsheet program has become as much a mainstay of business as the expense account. And deservedly so. A spreadsheet lets you record numbers more neatly and efficiently than a ledger does, and it lets you calculate and analyze them. You can plug in new values and watch the spreadsheet recalculate accordingly. You can ask "what if?" questions: What if interest rates rose to 12 percent? What if we got a 20-year mortgage instead of a 30-year?

A spreadsheet does for you what a flight simulator does for a pilot: It lets you explore different approaches to a problem — without the risk. And because life is full of problems and risks, spreadsheets have 1,001 uses. You can use them to create business plans, profit-and-loss statements, forecast sales figures, track stock market data, and print loan-amortization tables — in short, any endeavor that involves playing with numbers. And their orderly approach to storing information makes them ideal for other tasks, from managing address files to creating columnar tables (see the Quick Tips box "Other Ways to Use a Spreadsheet").

ON THE CD

- ClarisWorks

QUICK TIPS

Other Ways to Use a Spreadsheet

A spreadsheet's capability to neatly pigeonhole text and numbers makes it a good basic database manager. When using a spreadsheet for data management, label columns with your field names (such as Name, Address, Phone) and build down from there, making each row a record. There's no need to fuss with field definitions and maximum character lengths. Every cell accepts any combination of text or numbers, and most spreadsheets hold up to 255 characters per cell. You can also use the spreadsheet's library of functions and math features to analyze data and create reports.

Many spreadsheets provide additional commands for managing data and for creating data-entry forms that show one record at a time. But remember, spreadsheets generally don't offer the sophisticated form-layout features or the extensive entry-checking features of true databases.

Finally, a spreadsheet's columnar bent can make it a wonderful "table processor." (Indeed, most of the large product-features tables you see in *Macworld* articles began life as spreadsheets.) You can add new columns or rows with a mouse click and resize columns in a flash — instead of struggling with rulers and tab settings. If you need fancy formatting, move the completed table into a word processor by copying its cells to the Clipboard or by saving it as a text-only file.

Everything in Its Cell

The secret to a spreadsheet's organizational virtues is its grid-like approach to storing information. A blank spreadsheet is divided into horizontal and vertical lines that create a grid of boxes called *cells* (see Figure 5-1 "Spreadsheet Basics"). The horizontal lines form *rows*, and the vertical lines form *columns*. Rows are labeled by number and columns by letter, to give every cell its own address: A1 is the cell in the upper-left corner of the spreadsheet. B4 is the cell in the second column, four rows down. (Some spreadsheets number both rows and columns: A1 becomes R1C1, and B4 is R4C2. Many programs let you choose the numbering scheme you prefer.)

Each cell can hold a number, some text, or a *formula* — a combination of cell addresses and math symbols that tell the program what to do with those numbers. A simple spreadsheet contains text *labels* that describe the numbers in adjacent cells and a formula (see Figure 5-2 "Weekly Pay").

But the real power of a spreadsheet surfaces when you create formulas that manipulate the results of other formulas. In Figure 5-3 "Monthly and Yearly Pay," I've tied two new formulas to the result of "Weekly Pay." This causes any changes in the *Hours Worked* or *Hourly Wage* cells to show up in the *Weekly Pay*, *Monthly Pay*, and *Yearly Pay* cells. To answer the question, "What if I earned $15 an hour instead of $10?" simply type **15** in cell B2 and press Return.

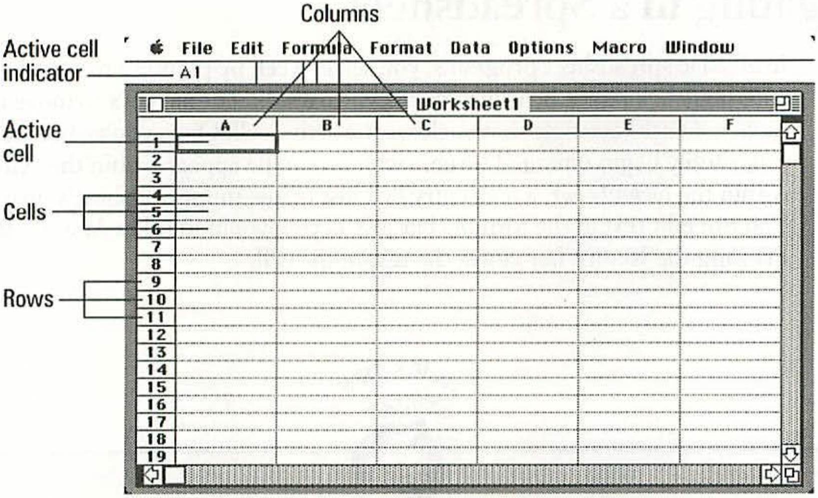
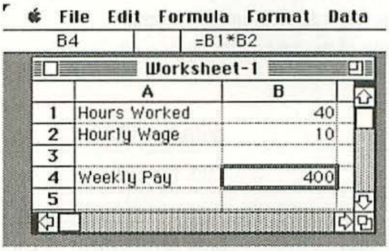


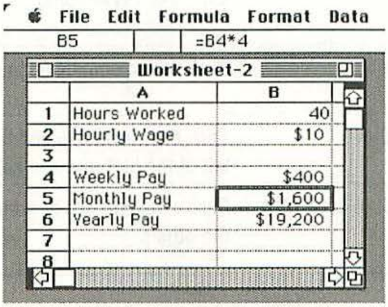
Figure 5-1: Spreadsheet Basics Horizontal and vertical lines divide a spreadsheet's window into a grid of boxes called cells, each with its own address (Al is the cell in the upper-left corner). A bold rectangle indicates the active cell.



B4 =B1*B2

	A	B
1	Hours Worked	40
2	Hourly Wage	10
3		
4	Weekly Pay	400
5		

Figure 5-2: Weekly Pay This spreadsheet uses a formula to calculate weekly income based on number of hours worked and hourly wage. The formula itself appears in cell B4, and tells the spreadsheet program, "Multiply the contents of cell B1 by the contents of cell B2, and display the result here."



B5 =B4*4

	A	B
1	Hours Worked	40
2	Hourly Wage	$10
3		
4	Weekly Pay	$400
5	Monthly Pay	$1,600
6	Yearly Pay	$19,200
7		
8		

Figure 5-3: Monthly and Yearly Pay Building on the formula in Figure 5-2 "Weekly Pay," the monthly pay formula multiplies weekly pay by 4, while the Yearly Pay formula multiplies monthly pay by 12. As you enter different wage and hour values, the spreadsheet instantly recalculates the weekly, monthly, and yearly pay.

Navigating in a Spreadsheet

In all Mac spreadsheet programs, you select a cell by pointing to it with the mouse and then clicking, or by using your keyboard's directional keys to move the *cell pointer*, a dark rectangle that encloses the active cell. Once you've homed in on a cell, simply begin typing. The characters you type appear within the cell and also within the *formula bar*, a text-entry box just below the spreadsheet's menu bar. You can edit text in the formula bar just as you would in other Mac applications. Pressing the Return key stores the text in the cell.

QUICK TIPS

Cell Selection Strategies

Selecting (highlighting) cells is one of the most common tasks you perform in a spreadsheet. Creating graphs, formatting cells, reorganizing a worksheet, or transferring information into another program are only some of the tasks that begin with selecting.

All spreadsheet programs provide similar mouse and keyboard sequences, which are summarized in the following table.

To Select...	*With the Mouse...*	*With the Keyboard...*
One cell	Click the cell	Move the cell pointer using the arrow keys
Several adjacent cells	Drag across them, or click the first cell and then Shift-click the last cell	Hold the shift key and then use the arrow keys
An entire row	Click the row heading	Press ⌘-Shift-right arrow or ⌘-Shift-left arrow
An entire column	Click the column heading	Press ⌘-Shift-up arrow or ⌘-Shift-down arrow
The entire worksheet	Click the box above and to the left of the first row and column	Press ⌘-A
Cells not adjacent to each other	Select the first cell or group of cells and then press ⌘ to select the others	

How does the spreadsheet know whether you've typed a label, a numeric value, or a formula? Most programs follow this approach: If you type only numbers, the entry is treated as a value. If it contains any letters or spaces, it's treated as a label. If the first character is an equal sign (=), the spreadsheet considers it a formula. If the first character is a double quote ("), the spreadsheet considers the text a label.

Manipulating Data with Functions

Spreadsheet programs also contain a number of preprogrammed formulas called functions, which provide advanced math skills. You needn't remember any complex math symbols to use a function; simply type its name (or choose it from a dialog box or menu), and enclose the required values, called *arguments*, within parentheses. The function performs its preprogrammed calculation on the arguments and returns a result.

One statistical function that all spreadsheets provide is SUM, which adds its arguments. In a spreadsheet function, a colon (:) between two cell addresses indicates a *range* of cells, while a comma between cell addresses denotes individual cells. For example, the Excel formula =SUM(B1:B3) adds the contents of cells Bl through B3 (the short form of =B1+B2+B3), and the formula =SUM(B1,B5,B7) adds the contents of cells B1, B5, and B7. (Unless otherwise noted, I use Excel in all the examples in this chapter, because it's the Mac world's most popular spreadsheet program. All of the concepts here apply to other spreadsheets, too, but the exact spelling — the *syntax* — of formulas or functions may differ.)

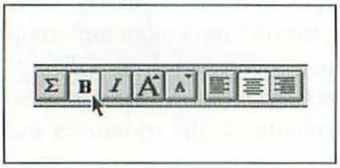
Other statistical functions include AVERAGE, which calculates the average value of given arguments; and MAX and MIN, which return the largest and smallest values, respectively, within the list of arguments. Spreadsheets also provide mathematical functions such as ABS, which returns the absolute value of an argument; and ROUND, which rounds the value off to a specified number of digits. Then there are trigonometric functions like COS, which gives the cosine; and TAN, which calculates the tangent. Text functions search and manipulate text. Financial functions calculate present and future values, rates of return, and more. Date functions return the current date and time and calculate differences between dates or times. A spreadsheet's seemingly endless library of functions is its ultimate weapon for manipulating text and numbers.

Functions become even more powerful when you nest them within other functions so that one function uses the value returned by another function as an argument. For example, the Excel formula =MID(A1,1,SEARCH(", ",A1,1)-1) uses two text

STEP-BY-STEP

Basic Spreadsheet Formatting in Microsoft Excel

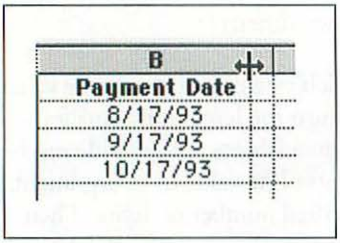
This box shows how to perform common spreadsheet formatting tasks in the Mac world's most popular spreadsheet program, Microsoft Excel. These basic concepts also apply to Lotus 1-2-3 and Claris Resolve, although the specific commands and tool palettes vary.



To format a cell or range of cells:

1. **Select the cell or range of cells you want to format.**
2. **Click the desired formatting button in the toolbar, or choose the appropriate command from the Format menu, as shown in the following table.**

To...	*Choose...*
Change the way numbers are displayed	Number
Specify the alignment of values within cells	Alignment
Change the typeface, size, style, or color of a cell's contents	Font
Add a border to a cell or change a cell's border style or border color	Border
Add shading to a cell or change the pattern, color, or shading	Patterns



B
Payment Date
8/17/93
9/17/93
10/17/93

To change the width of a column:

1. **In the column heading area, point to the vertical bar that separates the column from the one to its right.**
   The mouse pointer turns into an arrow pointing left and right, as shown here.
2. **Drag left or right to change the width of the column.**
   If you select multiple columns before performing step 2, each column's width is changed to match the one you resized.

— or —

1. **Select any cell in the column.**
   You can also select the entire column or a series of columns.
2. **Choose Column Width from the Format menu.**
   The Column Width dialog box appears.
3. **Type a value of between 0 and 255.**
   Typing 0 (zero) is the same as choosing the Hide button.
4. **Click OK or press Return.**

— or —

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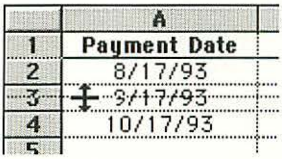
1. **In the column heading area, double-click the vertical bar that separates the column from the one to its right.**
   Excel changes the column's width to accommodate the longest cell entry in the column. This is the same as choosing the Best Fit button in the Column Width dialog box. Excel bases the width on the screen font you're using. To get an accurate preview of how your hard copy will look, use the Print Preview command. You can also adjust the width of columns in the Print Preview window.



To change the height of a row:

1. **In the row heading area, point to the horizontal bar that separates the row from the one below it.**
   The mouse pointer turns into an arrow pointing up and down, as shown here.
2. **Drag up or down to change the row's height.**
   If you select multiple rows before performing step 2, each row's height is changed to match the one you resized.

— or —

1. **Select any cell in the row.**
   You can also select the entire row or a series of rows.
2. **Choose Row Height from the Format menu.**
   The Row Height dialog box appears.
3. **Type a value of between 0 and 409.**
   Typing 0 (zero) is the same as choosing the Hide button.
4. **Click OK or press Return.**

— or —

1. **In the row heading area, double-click the horizontal bar that separates the column from the one below it.**
   Excel changes the row's height to accommodate the largest font size in the row. This is the same as choosing the Best Fit button in the Row Height dialog box.

functions, MID and SEARCH, to extract the last name from a cell (A1) containing names in "last name, first name" format. Excel first executes the SEARCH function to locate the comma. SEARCH reports its findings to MID, which takes over to extract all the characters up to the comma.

QUICK TIPS

Resizing Column Widths Instead of Using Blank Columns

When a spreadsheet's column headings are wider than the data below them, the headings intrude into adjacent columns and obscure each other. To fix this problem, many people put a blank column between each column. Although this works, a better way to put more space between two columns is to resize the columns themselves using the techniques described in this chapter. Resizing columns uses memory more efficiently and makes it easier to scroll through the spreadsheet.

Sprucing It Up with Formats

Spreadsheets calculate numbers with a high degree of precision, using droves of decimal places (14, in Excel's case) to represent fractional values as accurately as possible. But that kind of precision is overkill for some data. A dollars-and-cents value doesn't look like one when 14 digits follow the decimal point.

Cell formats enable you to specify how you want numbers and text to be displayed. You can have dollars-and-cents figures appear with a dollar sign and only two digits after the decimal point. You can have percent signs appear after values that represent a percentage of other values. For date values, you can specify display formats such as 8/17/93 or 17-Aug-93. Appropriate display formats can make spreadsheet values more meaningful.

Another aspect of spreadsheet formatting involves specifying the alignment of data within cells. Numbers, for example, are usually aligned against the right edge of their cells, with their decimal points aligned. Text is usually aligned against the left edge. You can also choose to center text within a cell — handy for a title that appears above a column of numbers.

Mac spreadsheets provide other formatting options as well, including the capability to format cells in different fonts and styles. Excel, Lotus 1-2-3, and Claris' Resolve all support color graphs and cell formats. These programs also let you create borders and lines and add shading to cells to highlight key figures or underscore totals. You can use these border features to create worksheets that look like paper forms.

Making Things Manageable

A single spreadsheet document provides many thousands of blank cells, ready for facts and formulas. But you'll probably run out of memory and patience (as you scroll from one area of the spreadsheet to another) long before filling all of them.

Linking documents together

One solution to both problems is a program that enables you to link separate documents, causing changes made in one to appear in the other. Linking separate spreadsheets lets you work around memory limitations and simplifies creating and using a complex spreadsheet application.

While the specific steps vary between products, you usually link spreadsheets by creating a formula in one spreadsheet that refers to one or more cells in the second spreadsheet. For example, assume you're working with two spreadsheets, named Income and Expenses, and you want to link them so that the contents of the Income spreadsheet's Net Income cell are copied into the Net Income cell of the Expenses worksheet. To do so in Excel, create a formula in the Net Income cell of the Expenses worksheet reading =Income!$E2.

Saving time with macros

Another way to tame a spreadsheet is through *macros*, series of formulas and commands that carry out actions at your command. A macro is like an electronic autopilot you can program to perform repetitive tasks — anything from choosing commands to entering formulas to performing complex calculations. You can find basic macro features in Microsoft Works and ClarisWorks, and far more advanced ones in Excel, Claris Resolve, and Lotus 1-2-3.

You can create macros from scratch by typing their commands one at time, but an easier way is to use the program's *macro recorder*. Activate the macro recorder, and the program watches you work, translating your actions into macro statements. When you replay the resulting macro, it repeats the steps you performed. You can also edit your macros to add additional functions.

Creating customized dialog boxes

The macro languages in Excel, 1-2-3, and Resolve go even further in enabling you to create customized dialog boxes, menus, on-screen buttons, and other user interface elements. You (or a consultant) can use these features to create customized spreadsheets that work like standard Mac applications. For example, a business may create an accounting system with menu commands such as Display Outstanding Invoices or Print Inventory Report. Behind these commands would be macro statements that perform the appropriate tasks. Such a spreadsheet can be used by an administrative assistant or temporary employee who may not otherwise know how to generate graphs or display outstanding invoices.

These kinds of customized applications are often called turnkey applications, because, metaphorically speaking, all you have to do is turn the key to be off and running. You may also hear a turnkey spreadsheet application described as a template. A large library of spreadsheet templates is available from Heizer Software.

Using on-screen tool palettes

Today's spreadsheet programs offer additional time-savers — on-screen tool palettes for choosing often-used commands and formatting options. Microsoft Excel has a particularly extensive collection of these palettes, which Microsoft calls *toolbars.* The next chapter describes these and other spreadsheet streamliners.

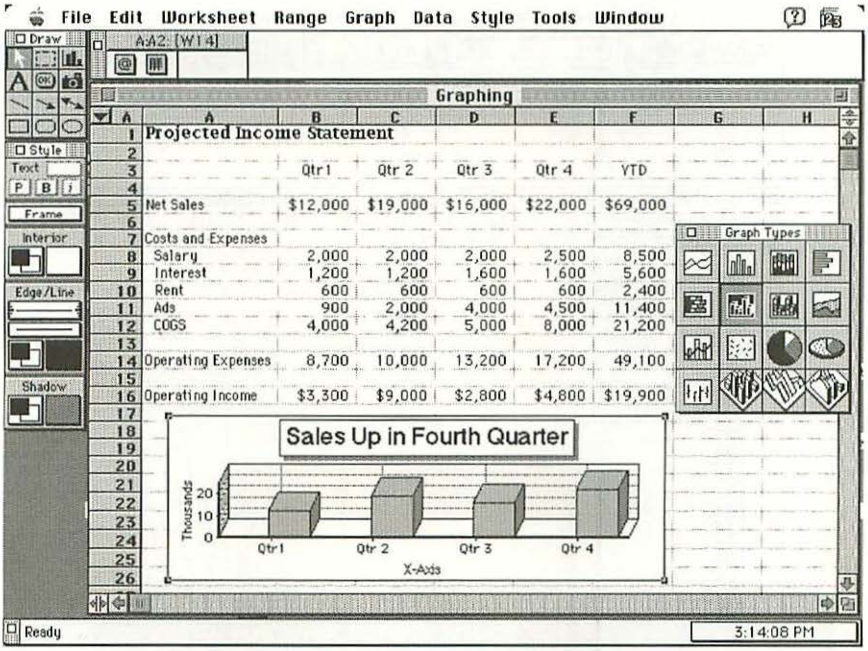
Choosing the Right Spreadsheet Program

Besides number-analyzing prowess, Mac spreadsheet programs often have a variety of other features that can transform monotonous rows and columns of numbers into graphs and charts, interesting-looking reports, or powerful forecasting tools.

Many spreadsheet programs have built-in graphing features that create spiffy bar, line, or pie charts. You can even place your spreadsheets and graphs on the same page (see Figure 5-4 "Tables and Charts"). In Excel, you can resize a bar or line in a graph and change its corresponding spreadsheet data. This feature is useful for goal-seeking tasks — for example, if you want sales to increase by 10 percent next year, you can drag the appropriate line in a chart, and Excel changes the underlying spreadsheet to show what is needed for you to meet your goal.

Spreadsheet programs can also create graphs that have a three-dimensional look to them, and even enable you to rotate the graph and change its perspective. Graphs and spreadsheets team up well for analyzing numbers and spotting trends; a rising or falling line tells a more compelling story than a nondescript table of numbers.

Because graphs and tables often end up in reports, all spreadsheet programs let you copy graphs and spreadsheet cells to the Clipboard for subsequent pasting into a word processor or desktop publishing program. Most programs also support System 7's publish and subscribe features, which, as you'll see in the next chapter, enable you to create a link between a spreadsheet document and another program.



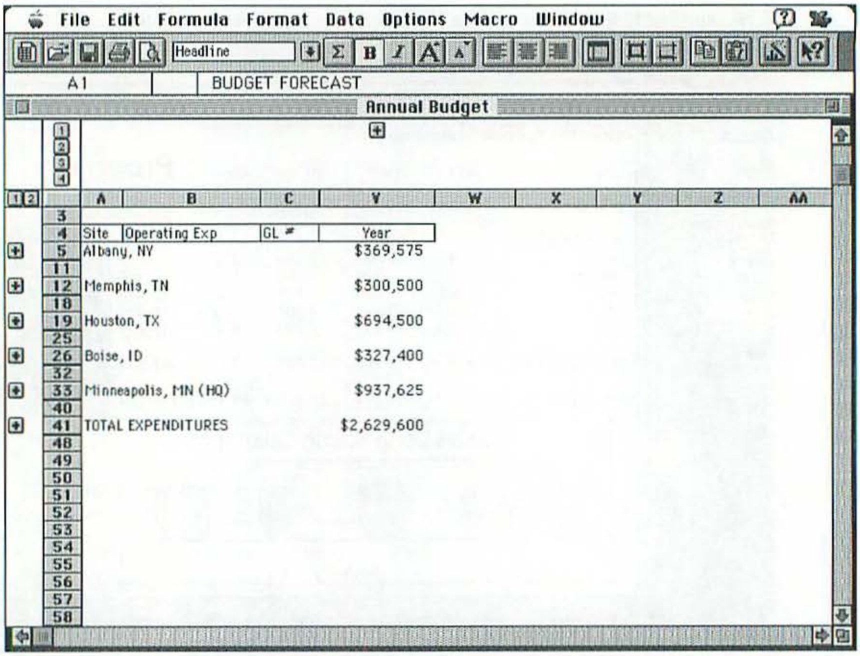
A	A	B	C	D	E	F
1	Projected Income Statement					
2						
3		Qtr1	Qtr 2	Qtr 3	Qtr 4	YTD
4						
5	Net Sales	$12,000	$19,000	$16,000	$22,000	$69,000
6						
7	Costs and Expenses					
8	Salary	2,000	2,000	2,000	2,500	8,500
9	Interest	1,200	1,200	1,600	1,600	5,600
10	Rent	600	600	600	600	2,400
11	Ads	900	2,000	4,000	4,500	11,400
12	COGS	4,000	4,200	5,000	8,000	21,200
13						
14	Operating Expenses	8,700	10,000	13,200	17,200	49,100
15						
16	Operating Income	$3,300	$9,000	$2,800	$4,800	$19,900

Figure 5-4: Tables and Charts Excel, Claris Resolve, and Lotus 1-2-3 (shown here) let you mix graphs and spreadsheet cells in the same document. All three programs also support 3-D graphs and color.

As a spreadsheet document grows, it can become difficult to see the forest for the trees. The big picture — totals, summaries, and the like — gets buried within a mass of numbers, rows, and columns. Microsoft Excel addresses this problem beautifully with a built-in outlining feature that lets you expand and collapse a spreadsheet to show various levels of detail (see Figure 5-5 "Outlining a Spreadsheet"). You can collapse a spreadsheet to show only summaries and key points, expand it to show the ugliest little details, or anything in between. It's a terrific innovation.

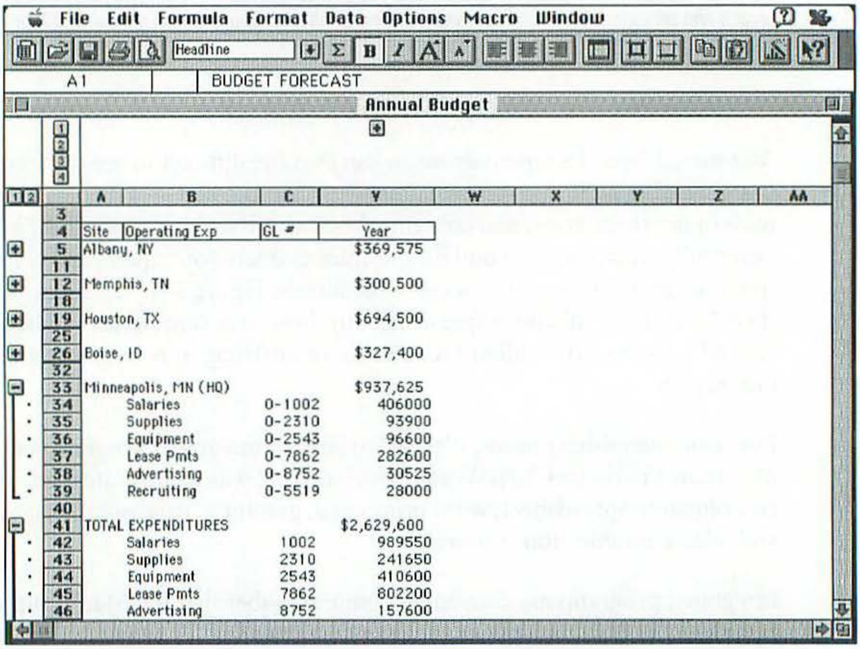
For basic spreadsheet needs, it's hard to beat an integrated program such as Microsoft Works or ClarisWorks, which take a Swiss army knife approach by consolidating spreadsheet, word processing, graphing, database management, and telecommunications features.

Integrated programs are convenient, but remember that the Mac's Clipboard and Scrapbook let you create your own integrated workplace by cutting and pasting information between programs. System 7 (or the System 6 MultiFinder) lets you do so without quitting and restarting each application — provided your Mac has enough memory, of course.



A1 BUDGET FORECAST

	A	B	C	V
3				
4	Site	Operating Exp	GL #	Year
5	Albany, NY			$369,575
11				
12	Memphis, TN			$300,500
18				
19	Houston, TX			$694,500
25				
26	Boise, ID			$327,400
32				
33	Minneapolis, MN (HQ)			$937,625
40				
41	TOTAL EXPENDITURES			$2,629,600
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				



A1 BUDGET FORECAST

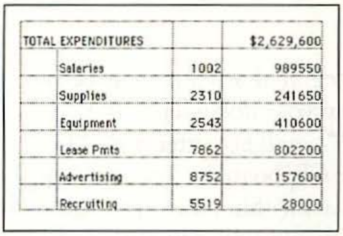
	A	B	C	V
3				
4	Site	Operating Exp	GL #	Year
5	Albany, NY			$369,575
11				
12	Memphis, TN			$300,500
18				
19	Houston, TX			$694,500
25				
26	Boise, ID			$327,400
32				
33	Minneapolis, MN (HQ)			$937,625
34		Salaries	0-1002	406000
35		Supplies	0-2310	93900
36		Equipment	0-2543	96600
37		Lease Pmts	0-7862	282600
38		Advertising	0-8752	30525
39		Recruiting	0-5519	28000
40				
41	TOTAL EXPENDITURES			$2,629,600
42		Salaries	1002	989550
43		Supplies	2310	241650
44		Equipment	2543	410600
45		Lease Pmts	7862	802200
46		Advertising	8752	157600

Figure 5-5: Outlining a Spreadsheet Microsoft Excel provides an outlining feature that lets you expand and collapse parts of a spreadsheet to show various levels of detail. At top, the spreadsheet has been collapsed to show only the summary information. At bottom, two sections of the same spreadsheet have been expanded to show the details. Outlining features are common in word processors, but Excel is the first program to apply outlining concepts to spreadsheets.

STEP-BY-STEP

Including Spreadsheet Results in Other Programs

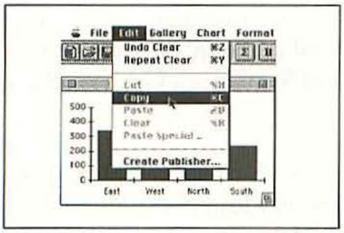
If you're preparing a report, you may need to transfer numbers or graphs from a spreadsheet program into a document you're creating with a word processor or publishing program. In this Step-by-Step box, you'll find instructions for copying information from a spreadsheet and pasting it into another program. Chapter 28 has all the details on the Mac's data-exchange features, including System 7's slick publish and subscribe features. There's also a Step-by-Step box "Publishing and Subscribing" in the next chapter that shows you how to use publish and subscribe to include spreadsheet data in another program.



TOTAL EXPENDITURES			$2,629,600
	Salaries	1002	989550
	Supplies	2310	241650
	Equipment	2543	410600
	Lease Pmts	7862	802200
	Advertising	8752	157600
	Recruiting	5519	28000

To move the contents of some cells into another program:

1. **Select the cells whose contents you want to appear in the other program.**
   For a look at the ways you can select spreadsheet cells, see the Quick Tips box "Cell Selection Strategies" earlier in this chapter.
2. **Choose Copy from the Edit menu.**
   The contents of the cells are placed on the Mac's Clipboard.
3. **Start or switch to the program where you want to paste the cells.**
   If you want to paste them into a document you've already started working on, open that document.
4. **Choose Paste from the Edit menu.**
   The data is pasted into the active document. If you paste from Excel to Microsoft Word (shown at left), the data appears, with formatting intact, as a Word table. If you paste into another word processor or into a publishing program, each cell is separated by a tab character. You may need to use the formatting ruler in the word processor or publishing program to adjust the tabs for better spacing between columns.



To copy a graph into another program:

1. **If the graph is part of a worksheet, select the graph by clicking it once.**
   If the graph is in an Excel chart window, you don't have to perform this step.
2. **Choose Copy from the Edit menu.**
   The graph is placed on the Mac's Clipboard.

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3. Start or switch to the program where you want to paste the graph.

If you want to paste the graph into a document you've already started working on, open that document.

4. Choose Paste from the Edit menu.

If you paste a graph into a drawing program (or into the drawing module of an integrated program), you can modify the individual components of the graph — its bars, text labels, and so on. See Chapter 13 for some graph customizing ideas.

If you need a spreadsheet only occasionally, an integrated program may be the most convenient way to include spreadsheet data in your documents. But if you plan to spend a great deal of time asking "what if?" you'll be better served by a powerhouse spreadsheet like Excel, relying on the Clipboard or System 7's publish and subscribe features to exchange and combine data within other applications as needed. (You can find instructions for using publish and subscribe with spreadsheets in the next chapter.)

If you create complex formulas containing flocks of functions and parentheses, look for a program that lets you "attach" notes to cells. Cell notes, electronic versions of Post-it notes, are an effective way to describe how large formulas work or how the spreadsheet is structured — details that are easy to forget and difficult to decipher.

If you're shopping for heavy-duty spreadsheets, look for these two techie-sounding features: *sparse matrix memory management* and *minimal recalculation.* Sparse matrix memory management is an efficient method of spreadsheet storage that doesn't waste memory on empty cells, letting you squeeze more into the machine's memory. Programs that use minimal recalculation recalculate spreadsheets by keeping track of which cells depend on the contents of other cells. Thus, they recalculate only those cells that are dependent on the cells you change, which takes far less time than checking and recalculating every cell in the spreadsheet. Some integrated programs, including Microsoft Works and Symantec's GreatWorks, do not always perform minimal recalculation.

Also consider your own experience and the programs with which you plan to use the spreadsheet. For example, Microsoft Word users may lean toward Excel because of how well the two exchange data. Claris FileMaker Pro or ClarisWorks users may prefer Resolve because it operates similarly. And spreadsheet veterans who cut their teeth on the IBM PC version of Lotus 1-2-3 are able to apply their experience to the Mac version.

QUICK TIPS

Keeping Headings Visible When You Scroll

A common annoyance with large spreadsheets is that their row and column headings disappear when you scroll — the headings go out the window, you might say. To remember what kind of data a given row or column holds, you need to scroll all the way back to the top or left edge of the worksheet.

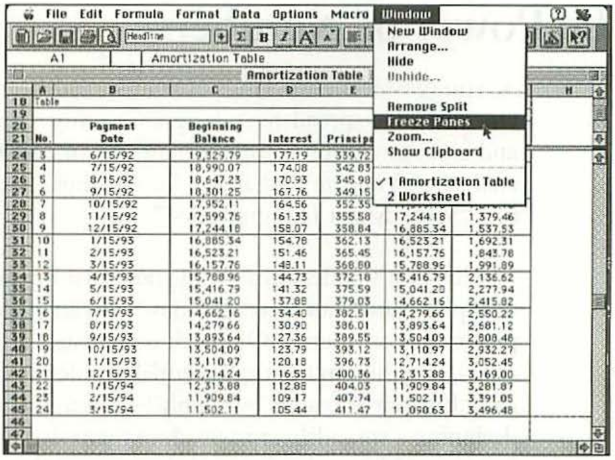
Or do you? Most spreadsheet programs have window-management features that enable you to keep row and column headings visible while the rest of the spreadsheet scrolls around them. One technique is to split the spreadsheet window using the split bars that all spreadsheet programs provide.

To split a spreadsheet window, first scroll the window so you can see the row or column headings you want to keep in view. Drag the window's horizontal or vertical split bar until it's below the column headings or to the right of the row headings. (The split bars are located above and to the left of the vertical and horizontal scroll bars, respectively.)

If you use Excel (as shown in the adjacent figure), you can neaten up the window — removing the extra scroll bars and borders created when you split a window — by choosing Freeze Panes from the Window menu. If you need to adjust the panes later — maybe you changed the headings' font or size, and now they don't fit the original size — choose Unfreeze Panes and then drag the split bar as needed.

You can apply this window-splitting technique to Lotus 1-2-3, but a better way is to use 1-2-3's Titles command, located in the Worksheet menu. To freeze a row of horizontal titles, simply select any cell directly below the titles and then choose Titles from the Worksheet menu. In the Worksheet Titles dialog box, choose the Horizontal option and then click OK or press Return. To freeze a column of vertical titles, select a cell to the right of the titles, choose the Titles command, and then choose the Vertical option. To freeze both the row and column titles, choose the Both option.

Unlike Excel, 1-2-3 doesn't let you change the contents of frozen cells. If you need to edit a heading, choose Titles and click the None option. (You don't have to select a specific cell first.)



A1 Amortization Table

Amortization Table

	A	B	C	D	E	F	G
18	Table						
19							
20		Payment	Beginning				
21	No.	Date	Balance	Interest	Princip		
24	3	6/15/92	19,329.79	177.19	339.72		
25	4	7/15/92	18,990.07	174.08	342.83		
26	5	8/15/92	18,647.23	170.93	345.98		
27	6	9/15/92	18,301.25	167.76	349.15		
28	7	10/15/92	17,952.11	164.56	352.35		
29	8	11/15/92	17,599.76	161.33	355.58	17,244.18	1,379.46
30	9	12/15/92	17,244.18	158.07	358.84	16,885.34	1,537.53
31	10	1/15/93	16,885.34	154.78	362.13	16,523.21	1,692.31
32	11	2/15/93	16,523.21	151.46	365.45	16,157.76	1,843.78
33	12	3/15/93	16,157.76	148.11	368.80	15,788.96	1,991.89
34	13	4/15/93	15,788.96	144.73	372.18	15,416.79	2,136.62
35	14	5/15/93	15,416.79	141.32	375.59	15,041.20	2,277.94
36	15	6/15/93	15,041.20	137.88	379.03	14,662.16	2,415.82
37	16	7/15/93	14,662.16	134.40	382.51	14,279.66	2,550.22
38	17	8/15/93	14,279.66	130.90	386.01	13,893.64	2,681.12
39	18	9/15/93	13,893.64	127.36	389.55	13,504.09	2,808.48
40	19	10/15/93	13,504.09	123.79	393.12	13,110.97	2,932.27
41	20	11/15/93	13,110.97	120.18	396.73	12,714.24	3,052.45
42	21	12/15/93	12,714.24	116.55	400.36	12,313.88	3,169.00
43	22	1/15/94	12,313.88	112.88	404.03	11,909.84	3,281.87
44	23	2/15/94	11,909.84	109.17	407.74	11,502.11	3,391.05
45	24	3/15/94	11,502.11	105.44	411.47	11,090.63	3,496.48
46							
47							

Speaking of PCs, if you work in an office that uses DOS PCs as well as Macs, look closely at Excel and 1-2-3. Both are also available for PCs; the PC versions use the Microsoft Windows graphical environment I mentioned in Chapter 1, and operate nearly identically to their Mac cousins. By standardizing on the Mac and PC versions of either of these programs, you can easily move spreadsheets between Macs and PCs and minimize training time, because both versions are so similar.

If memory is at a premium, consider Bravo Technologies' MacCalc. It's fast, easy to use, and compares favorably against its more corpulent competitors. There's also Zedcor's Desk, a collection of desk accessories, one of which, DeskCalc, is a mini spreadsheet. In the shareware arena, there's BiPlane, which comes in both application and desk accessory versions. (See Chapter 18 for details about shareware.)

In the end, however, you are probably better off choosing a mainstream program such as Excel or 1-2-3. As the most popular Mac spreadsheets, both have the largest selection of templates and training materials. The Mac world is littered with also-ran spreadsheets — Claris Resolve, Informix Wingz, and FullImpact from the now-defunct Ashton-Tate. All three programs are powerful and elegantly designed, but are not major players in a market Excel and 1-2-3 (particularly Excel) continue to dominate.

The Power of Numbers

As you master the workings of your spreadsheet program, don't forget the importance of good spreadsheet design. Creating a spreadsheet that's easy to understand and maintain requires forethought and an understanding of the problem you're analyzing. You can find advice for creating effective spreadsheets in the Quick Tips box "Spreadsheet Design Basics."

Finally, don't underestimate the potential for spreadsheet abuse. These days, business plans and sales forecasts come with an entourage of facts and figures depicting profits and prosperity. Often, those statistics are supplied by the project's proponents, and therein lies the potential problem. Anyone can doctor a spreadsheet to give the desired results by simply beginning with preselected figures, and then designing a spreadsheet to produce them. In such cases, the spreadsheet changes from a tool for evaluating options to a tool that supports decisions that have already been made.

The moral? Don't take someone else's spreadsheet figures at face value. Question the spreadsheet's underlying assumptions: Did its creator assume that profits will increase 20 percent each year, that interest rates will fall, that no competition exists, that costs will remain the same?

George Canning, a prime minister of Britain in the nineteenth century, said it best: "I can prove anything by statistics — except the truth."

QUICK TIPS

Spreadsheet Design Basics

Creating an effective, easily understood spreadsheet requires an organized approach and plenty of advance planning. According to John M. Nevison's excellent *The Elements of Spreadsheet Style* (1987, Brady), a spreadsheet "should be straightforward to build, easy to read, receptive to change, and, above all, free of error." Here are a few of Nevison's 22 spreadsheet rules.

Make a formal introduction

Explain the spreadsheet's purpose and design, as well as how to use it. Describe cells holding key information, and provide a table of contents listing key data sections.

Label every assumption

So that your readers can better understand your spreadsheet's structure, state up-front all its assumptions (for example, a 5 percent annual growth rate with a 7 percent annual depreciation rate).

Explain tricky formulas

If your spreadsheet offers cell-notation features, use them. Later, when you have to modify your formulas, you'll be glad you did. If a formula is particularly complex, consider dividing it across several cells.

Use cell naming

If your spreadsheet program lets you, assign names to a cell or range of cells to explain key formulas. The formula =HoursWorked*HourlyWage says a great deal more than =B7*B6.

Graph to illuminate

Be sure that graphs summarize their data well. Proofread them for style and content. And put each graph's conclusion in its title. For example, the title "Sales Up 20 Percent This Year" says more than "Year-to-Date Sales Results."

CHAPTER 5 CONCEPTS AND TERMS

- A spreadsheet is divided into horizontal and vertical lines that create a grid of boxes called cells, which hold numbers, text, or formulas.
- Spreadsheet programs contain preprogrammed formulas called functions, which perform calculations on values you specify.
- You can format a spreadsheet by specifying how you want numbers and text to appear and how you want the data aligned within cells.
- Ways to manage spreadsheets include linking separate worksheets together, and using *macros,* which are a series of formulas and commands that automate repetitive tasks.
- If you use a spreadsheet only occasionally, consider an integrated program such as ClarisWorks.

cell
A box that can hold a numeric value, text, or a formula. Cells are arranged in horizontal *rows* and vertical *columns.* Each cell has its own address; cell A1, for example, is in the upper-left corner.

cell pointer
A dark rectangle that encloses the current cell.

formula
A combination of math symbols and cell addresses that tell the spreadsheet program what to do with the values in those cells.

formula bar
A text-entry box that usually appears just below the spreadsheet's menu bar and that displays a formula, value, or text label as you type it. You can edit text in the formula bar just as you would in other Mac applications.

functions
Preprogrammed formulas that accept required values, called *arguments,* and return a result. All spreadsheet programs provide a large library of functions for statistical and financial calculations as well as for text.

goal-seeking
A method of spreadsheet analysis that involves supplying the desired result and allowing the spreadsheet to calculate the values required to obtain that result.

label
Descriptive text that appears in a cell adjacent to a value.

link
The process of tying two spreadsheet documents together via a formula in one spreadsheet that references one or more cells in the other. It's often easier to manage large spreadsheet projects if you divide them into separate documents and then link them.

macros
An automated series of formulas and commands that carry out specific actions.

range
A series of adjacent spreadsheet cells.

template
A "canned" spreadsheet that you purchase from a software developer and use as-is or modify to suit your needs.

CHAPTER SIX

Spreadsheet Tips and Techniques

IN THIS CHAPTER

- Working more efficiently with cell pointing and range naming
- Adding borders and shading to spreadsheet cells
- Creating one-click cell styles with Microsoft Excel
- Editing and formatting shortcuts for Microsoft Excel
- Linking spreadsheets to word processors with publish and subscribe

Business without spreadsheets? It's easier to imagine soup without sandwiches or Abbott without Costello. The spreadsheet program has been around for only a little more than a decade, yet it's hard to imagine doing business without it. Creating budgets and business plans, estimating profit and loss, forecasting sales, experimenting with mortgage options, analyzing statistics — spreadsheets have tamed these and myriad other calculation-intensive chores.

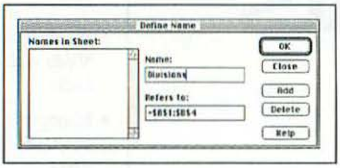
The basic concepts are simple. As you saw in the previous chapter, a spreadsheet is divided by horizontal and vertical lines into a grid of boxes called cells. You type numbers into the cells and then create formulas that describe the relationship between the numbers. You can then ask "what if?" questions — that is, you can plug different numbers into the formula to see how they impact the end result. Each time you change a number on which a calculation is based, the spreadsheet program recalculates the spreadsheet accordingly. In doing so, the spreadsheet enables you to learn the best approach to a specific problem and set of conditions.

Today's spreadsheet programs do much more than crunch numbers. You can turn rows of numbers into graphs that illustrate trends and relationships. The Mac's fonts and graphics features can make your spreadsheets easier to read and can enable you to create forms that look like they came from a publishing program. And data-exchange features let you include numbers and graphs in memos and reports. If your Mac is running Apple's System 7, you can even use publish and subscribe to automatically update the graphs and numbers in a report when the spreadsheet changes.

In this chapter, I show you how to take advantage of these and other spreadsheet features using Microsoft Excel and its chief competitor, Lotus 1-2-3. Much of the information here also applies to Claris Resolve as well as the spreadsheet modules in integrated packages such as Microsoft Works and ClarisWorks.

Spreadsheet Techniques for Microsoft Excel

This box shows how to apply the techniques described in this chapter to Microsoft Excel.

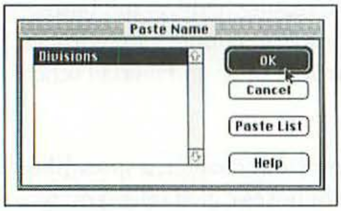


Name: Divisions

Refers to: =$B$1:$B$4

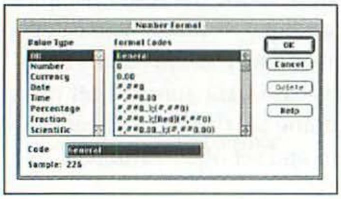
To name a cell or range of cells:

1. **Select the cell or cells to be named.**
   The previous chapter summarizes the techniques you can use to select cells.
2. **Choose Define Name from the Formula menu.**
   You can also use the ⌘-L keyboard sequence.
3. **Type a name and then click OK or press Return.**
   If the cell to the left of the active cell contains text, Excel proposes that text as the cell's name. If that's what you want, simply click OK.



To use a name in a formula:

1. **Choose Paste Name from the Formula menu.**
   The Paste Name dialog box appears.
2. **Select the desired name and then click OK or press Return.**
   You can also double-click the desired name.

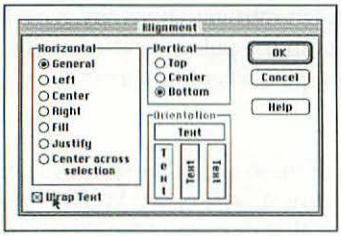


Code: General

Sample: 226

To change a number or date format:

1. **Select the cell or range of cells containing the numbers or dates you want to reformat.**
2. **Choose Number from the Format menu.**
   The Number Format dialog box appears.
3. **Double-click the desired format.**
   If you're using a common number format, you can choose the desired number format from the standard toolbar's style box instead of performing steps 2 and 3.



☒ Wrap Text

To format lengthy text labels so that they wrap around to the next line within each cell:

1. **Select the cell or cells containing the labels.**
2. **Choose Alignment from the Format menu.**
3. **Check the Wrap Text box.**

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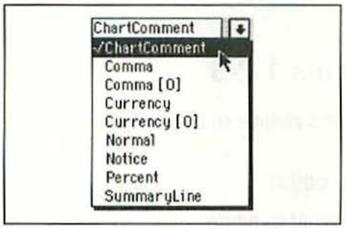
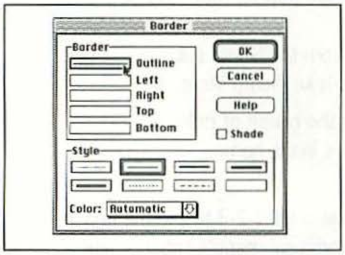


To reuse a set of number and text-formatting options:

1. **Format a cell as desired.**
2. **Type a brief, descriptive name in the style portion of the toolbar, and then press Return.**
   To apply that style to another cell, select that cell (or select a range of cells) and then choose the style's name from the toolbar's pop-up menu.



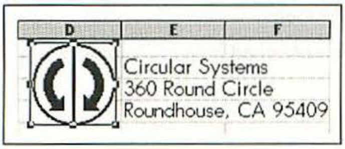
To add a border or borders to one or more cells:

1. **Choose Border from the Format menu.**
   The Border dialog box appears.
2. **Select the desired option, as described in the following table.**

To...	*Choose This Option...*
Border all four edges of each of the cells within a range	Left, Right, Top, and Bottom
Border only certain edges such as the top and bottom	Only those edges
Border the outer edges of a range	Outline
Shade the selected cells	Shade
Add color to the selected cells	The desired color from the Color pop-up menu

The following are tips to keep in mind when formatting cells with borders or shading:

- You can use the Style area of the Border dialog box to choose from eight line widths and patterns.
- You can reuse a border and shading arrangement elsewhere by selecting a bordered or shaded cell and then creating a style as described in the previous set of instructions.
- You can change the pattern Excel applies to shaded cells using the Format menu's Patterns command.
- Excel's AutoFormat tool lets you apply a variety of preset border and shading schemes to a range of cells. Check out the options described in Excel's manual; they may save you a lot of formatting time.



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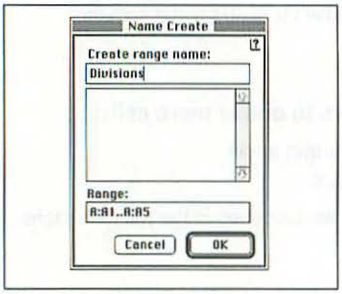
Roundhouse, CA 95409

To include a graphic in a spreadsheet:

1. **Open the graphic in the appropriate program, and then select it and choose Copy.**
   The graphic is placed on the Mac's Clipboard.
2. **Switch to or start Excel and open the desired worksheet.**
3. **Select the cell in which you want the graphic to appear.**
4. **Choose Paste from the Edit menu.**
   You can resize the graphic by dragging its handles. Press Shift while dragging a corner handle to resize the graphic and maintain its original proportions.

Spreadsheet Techniques for Lotus 1-2-3

This box shows you how to apply the techniques described in this chapter to Lotus 1-2-3.



Create range name: Divisions

Range: A:A1..A:A5

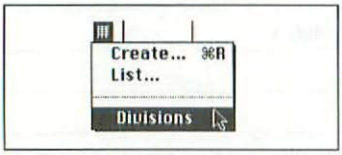
To name a cell or range of cells:

1. **Select the cell or cells you want to name.**
2. **Choose Create from the Range pop-up menu located in the console.**

   You can also choose Create from the Name submenu in the Range menu, or press the ⌘-R keyboard shortcut.
3. **Type a name for the cell or the range of cells.**

   If you like, you can use spaces in the name.
4. **Click OK.**

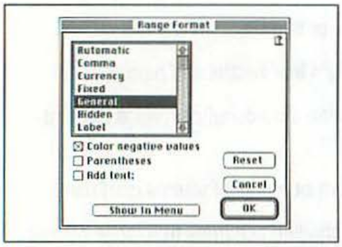
   When naming cells, you can also tell 1-2-3 to use the text in adjacent cells by using the Name submenu's Label Create command.



To add a cell or range name to a formula:

1. **Begin creating the formula as you usually do.**
2. **Select the name from the Range pop-up menu.**

   1-2-3 inserts the name at the location of the blinking insertion point.



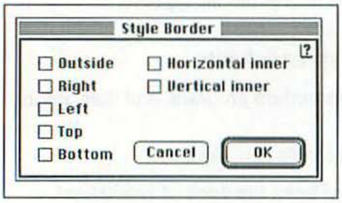
☒ Color negative values
☐ Parentheses
☐ Add text:

To change a cell's number or date format:

1. **Choose Format from the Range menu.**

   The Range Format dialog box appears.
2. **Select the format you want, and then click OK or press Return.**

   You can also use the Range Format dialog box to add often-used formats to the Range menu.



☐ Outside
☐ Right
☐ Left
☐ Top
☐ Bottom
☐ Horizontal inner
☐ Vertical inner

To add a border or borders to one or more cells:

1. **Choose Border from the Style menu.**
2. **Select the desired option, as described in the following table.**

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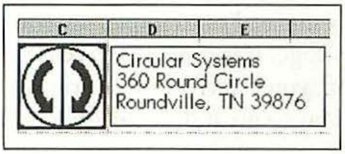
To Border...	***Choose This Option...***
The edges of a single selected cell	Outside
The top and bottom edges of a single selected cell	Top, Bottom
All four edges of each of the cells within a range	Outside, Horizontal inner, and Vertical inner
The outer edges of a range	Outside

The following are tips to keep in mind when formatting cells with borders and shading:

- You can also choose border options from the Style floating palette.
- You can shade a cell by choosing one of the light shaded patterns from the Style palette's pattern pop-up menu.
- You can apply an existing border or shading arrangement to other cells by selecting the bordered or shaded cells and choosing Copy. Next, select the cells you want to reformat and choose Paste Special. In the dialog box that appears, select the Styles and Formats option.



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To add a graphic created in another program to a worksheet:

1. **Open the graphic in the appropriate program, and then select it and choose Copy.**
   The graphic is placed on the Mac's Clipboard.
2. **Switch to or start 1-2-3 and open the worksheet you want to add the graphic to.**
3. **Select the Draw palette's Picture tool (the camera).**
4. **Click the worksheet in which you want the picture to appear.**
   You can resize the picture by dragging its corner handles; press Shift to avoid altering its proportions. To import the picture at a specific size, select the Picture tool and then drag across the worksheet to create a box of the desired size. To restore a picture's original size, double-click it.

Getting the Point with Formulas

Because formulas form the backbone of a spreadsheet, I begin this section with a few formulaic tips. One of the most tedious parts of creating a formula is specifying cell addresses. Add B4 to B2 and divide by G6 — it's enough to make you feel like yelling "Bingo!"

The *cell pointing* feature all spreadsheets provide simplifies creating formulas by eliminating the need to type addresses. After typing the equal or plus sign that denotes the beginning of a formula, simply point to the first cell to be included in the formula and then click. The program enters that cell's address in the formula. If you drag across a range of cells, the program creates the range reference for you.

Name that Cell

Unlike the spreadsheets in Microsoft Works and ClarisWorks, Excel, Lotus 1-2-3, and Resolve enable you to assign descriptive names to cells and cell ranges. You can take advantage of this to create more descriptive formulas. For example, say you're creating a spreadsheet that calculates a car's gas mileage. If you name the cells that hold the miles-driven and gallons-used information, you can create a descriptive formula such as =MilesDriven/GallonsUsed. That says a great deal more about the

QUICK TIPS

Accessing Often-Used Formats and Styles

Chances are you use similar number, text, and border formats throughout a spreadsheet. Instead of making trip after trip to the menu bar or tool palette to change formats, take advantage of the labor-saving features your program provides.

If you use Excel and you frequently use a specific font, size, and style combination, create a cell style for that combination as described in this chapter. It's the best way to cut down on repetitive formatting.

If you use Lotus 1-2-3 and you frequently use specific formats, click the Show In Menu button before closing the Style Font dialog box. (You can also use the Style floating palette to summon the plain, italic, or bold styles.) Remember that you can also use the Range Format dialog box to add often-used formats to the Range menu.

1-2-3 also lets you apply an existing border or shading arrangement to other cells: Select the bordered or shaded cells and choose Copy. Next, select the cells you want to reformat and choose Paste Special. In the dialog box that appears, select the Styles and Formats option.

QUICK TIPS

Copying Excel Cells as a Picture to Retain Formatting

Word and Excel mesh beautifully, but if you paste some cells copied from Excel into a different program, any text or border formatting you did in Excel is lost.

If you want to retain borders, shading, and other formats, copy the spreadsheet cells as a picture: In Excel, select the cells and then press Shift while opening the Edit menu. Notice the Copy command now reads Copy Picture. Choose Copy Picture, and then select the As Shown When Printed option. Now switch into the second program and paste. (Note that you can't edit the data you've pasted — if you need to change it, you'll have to return to Excel.) You can also use this technique to move a chart into another program.

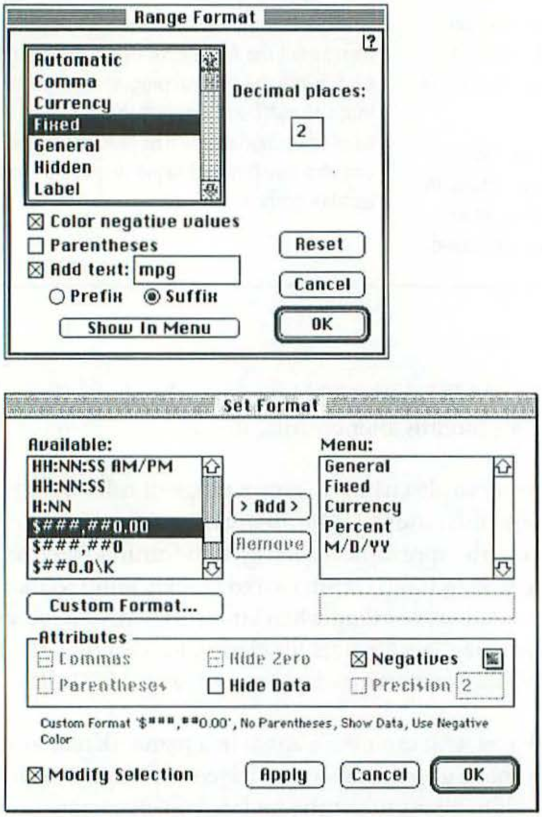
formula's workings than =A5/B5, and you'll appreciate the clarity if you have to modify the spreadsheet six months after creating it.

In all three programs, you can also name an entire range of cells. Select the cells by dragging across them, and then use the appropriate naming command. After you name a range, you can use the spreadsheet's navigation features (such as 1-2-3's Range pop-up menu or Excel's Goto command) to quickly jump to that range. This can spare you from tedious scrolling when you work with a large spreadsheet. You can also use a range name in a formula for clarity; for example, the 1-2-3 formula @SUM(QuarterlySales) is more descriptive than @SUM(B1..B6).

By the way, if you use Excel, you can't use a space in a name. (Excel won't let you do it.) If you want to simulate a space, use an underscore character, as in Quarterly_Sales. Press Shift-minus to get the underscore character.

Formatting Cells Appropriately

Spreadsheet programs calculate numeric values very accurately — using over a dozen decimal places. That's comforting, but it's often more precision than you really need. Dollars-and-cents values, for example, require two decimal places. The answer is cell formatting. Telling your spreadsheet to format currency values appropriately gives you not only an appropriate number of decimal points, but also a dollar sign (or the currency symbol of your choice). You can specify other types of numeric formats for noncurrency values (see Figure 6-1 "Numbering Your Options").



Decimal places: 2

☒ Color negative values
☐ Parentheses
☒ Add text: mpg
○ Prefix ● Suffix

☐ Commas ☐ Hide Zero ☒ Negatives
☐ Parentheses ☐ Hide Data ☐ Precision 2

Custom Format '$###,##0.00', No Parentheses, Show Data, Use Negative Color

☒ Modify Selection

Figure 6-1: Numbering Your Options Spreadsheets give you complete control over how numbers and date values appear in cells. In Lotus 1-2-3 (top), you can even specify that text appear before or after a value. If you use a specific formatting scheme often, click the Show In Menu button; thereafter, you can choose the scheme from the Range menu instead of using the Format dialog box. Claris Resolve (bottom) also lets you add often-used formatting schemes to its menus. Clicking on the small colored box next to the Negatives check box displays a pop-up palette that lets you choose a color for negative numbers. To have negative values appear in color in Lotus 1-2-3, choose the Color Negative Values option.

Cell-formatting features go beyond numbers to also include text and date values. You can specify whether text appears aligned against the left or right edge of a cell or centered within it. You can choose a variety of date formats that include the day of the week and various date and month abbreviation schemes. Most programs also let you specify that negative numbers appear in a color, bringing new meaning to the phrase "in the red."

All spreadsheets enable you to apply the Mac's variety of fonts, sizes, and type styles to cells. For example, you can format headings or key cells in bold. Want to fit more data on a page? Decrease the type size of every cell or use a narrower font, such as Helvetica Condensed. (If you use a laser or ink jet printer, you can accomplish the same result by specifying a reduction percentage in the Page Setup dialog box. This approach yields more cells per printed page without forcing you to squint at tiny cells on the screen.)

If you've changed a cell to appear in bold or in a larger type size, the cell's contents may not fit within the column's width. Excel and 1-2-3 provide a quick fix — double-click the cell's right column boundary, and the program resizes the column to accommodate its widest cell. In Claris Resolve, you must resize the column manually by dragging its boundary.

All three programs also provide a variety of keyboard shortcuts for changing cell alignment and type style. Excel's are summarized in the Quick Tips box "Microsoft Excel Keyboard Shortcuts."

What A Difference A Mac Makes

Before the Mac, spreadsheets were dull tables of numbers that only a bean-counter could find attractive. But not only do Mac spreadsheets provide access to the Mac's typographic talents, they also sport features that encroach on desktop publishing territory. In fact, if you need to create fill-in-the-blank forms such as invoices and insurance applications, a spreadsheet may be a better tool than a publishing program. The spreadsheet's row-and-column grid ensures that a form's elements are visually aligned with each other. You can configure cell borders to act as lines and boxes, and you can add shading to cells, rows, or columns to set them apart. Best of all, you can use the spreadsheet program itself to fill out and calculate values on the form.

(continued on page 126)

QUICK TIPS

Microsoft Excel Keyboard Shortcuts

This box lists some handy keyboard shortcuts for commonly used commands and options in Microsoft Excel.

Toolbar Shortcuts

To Do This...	*Do This...*
Quickly display any toolbar	Point to any visible toolbar, press 1-Option, and then choose the desired toolbar from the shortcut menu.
Access cell-format commands	With the mouse pointer in the worksheet area, press 1-Option, and then choose the desired command.
Move a toolbar	Double-click within the toolbar (but not within any buttons) or drag the toolbar until the dotted outline changes shape.
Turn a floating toolbar into a fixed toolbar	Double-click within the toolbar (but not within any buttons) or drag the toolbar until the dotted outline changes shape.

Editing Shortcuts

To Do This...	*Press...*
Enter the current date	1-hyphen (-)
Enter the current time	⌘-; (semicolon)
Create an outline border	⌘-Option-0
Copy a value from the cell above the active cell into the formula bar	⌘-Shift-" (double quote mark)
Insert a tab character in the formula bar	Option-Tab
Insert a line break in the formula bar	⌘-Option-Enter
Fill a selected range of cells with a formula	Option-Enter

Formatting Shortcuts

For This Format...	*Press...*
General	Control-Shift-L
Currency	Control-Shift-$
Percentage	Control-Shift-%
Exponential	Control-Shift-^
Date (day, month, year)	Control-Shift-#

(continued on the next page)

Formatting Shortcuts *(continued)*

For This Format...	*Press...*
Time (hour, minute, AM/PM)	Control-Shift-@
Two decimals, with commas	Control-Shift-!
Left border	⌘-Option-left arrow
Right border	⌘-Option-right arrow
Top border	⌘-Option-up arrow
Bottom border	⌘-Option-down arrow
Outline border	⌘-Option-0 (zero)
No borders	⌘-Option-hyphen (-)
Plain text	⌘-Shift-P
Bold	⌘-Shift-B
Italic	⌘-Shift-I
Underline	⌘-Shift-U

Note: To select the style box, press ⌘-Shift-L.

Quick Fills with Excel's Autofill Feature

Many spreadsheets require lists of incrementing or decrementing data called *data series.* One example is the sequence of numbers from 1 through 10. Other examples include the days of the week and the 12 months or four quarters of a year. Instead of manually typing each item in a data series — January, February, March, and so on — use Excel's autofill feature.

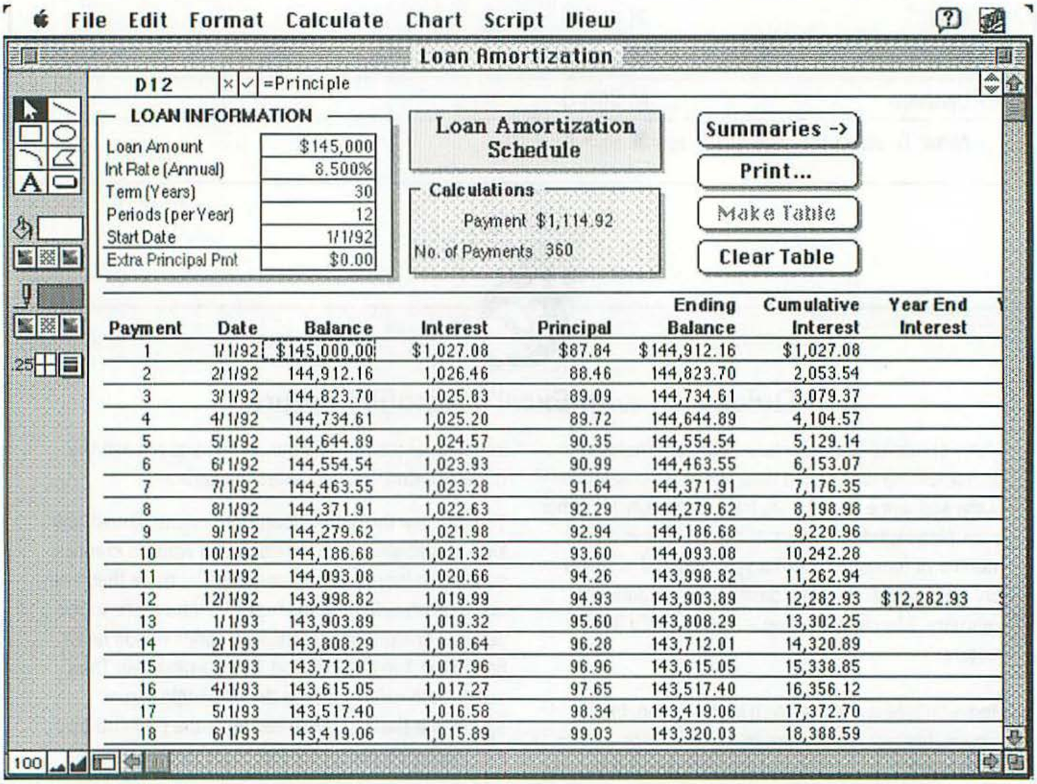
Begin by typing the first item in the series, for example, January. Then point to the *fill handle* — the small black box — at the lower-left corner of the cell containing the entry you just typed. Next, click and drag down or to the right (depending on where you want the rest of the data series to appear). As you drag, the current value in the series appears at the left edge of the formula bar. When you release the mouse button, Excel creates the series.

You can use the autofill feature to create almost any kind of repeating data series. If you want to create a series that increases or decreases by more than one unit in each cell, type the first two data items in the series. For example, to create a series of odd numbers, type **1** in one cell and **3** in the next cell. Then select both cells and drag the fill handle. Excel figures out the difference between the two entries and bases the rest of the series on this difference.

You can also use the fill handle to delete the contents of a cell or range of cells. Simply drag the fill handle up until a gray pattern fills the cell or cells, and then release the mouse button.

Even if you don't have publishing aspirations, you can use borders and shading to create more readable spreadsheets. If a spreadsheet contains long rows, add a top and bottom border to the cells in each row. This creates a line (in graphic arts parlance, a *rule*) that visually separates each row, lessening the chance that a reader's eyes will stray to adjacent rows as they scan across the spreadsheet. If your spreadsheet contains dozens of rows, consider adding a blank row after every five or ten rows to make the spreadsheet less dense on the screen. If you'll be printing the spreadsheet, consider applying a light shading to every other row. Figure 6-2 "Borders and Shading" illustrates these techniques.

Spreadsheets created with Excel, 1-2-3, and Resolve can even contain images created in other programs. As the Step-by-Step boxes in this chapter show, you can take advantage of this feature to add a company logo or scanned image to forms or spreadsheets.



D12 =Principle

LOAN INFORMATION

Loan Amount	$145,000
Int Rate (Annual)	8.500%
Term (Years)	30
Periods (per Year)	12
Start Date	1/1/92
Extra Principal Pmt	$0.00

Calculations

Payment $1,114.92

No. of Payments 360

Payment	Date	Balance	Interest	Principal	Ending Balance	Cumulative Interest	Year End Interest
1	1/1/92	$145,000.00	$1,027.08	$87.84	$144,912.16	$1,027.08	
2	2/1/92	144,912.16	1,026.46	88.46	144,823.70	2,053.54	
3	3/1/92	144,823.70	1,025.83	89.09	144,734.61	3,079.37	
4	4/1/92	144,734.61	1,025.20	89.72	144,644.89	4,104.57	
5	5/1/92	144,644.89	1,024.57	90.35	144,554.54	5,129.14	
6	6/1/92	144,554.54	1,023.93	90.99	144,463.55	6,153.07	
7	7/1/92	144,463.55	1,023.28	91.64	144,371.91	7,176.35	
8	8/1/92	144,371.91	1,022.63	92.29	144,279.62	8,198.98	
9	9/1/92	144,279.62	1,021.98	92.94	144,186.68	9,220.96	
10	10/1/92	144,186.68	1,021.32	93.60	144,093.08	10,242.28	
11	11/1/92	144,093.08	1,020.66	94.26	143,998.82	11,262.94	
12	12/1/92	143,998.82	1,019.99	94.93	143,903.89	12,282.93	$12,282.93
13	1/1/93	143,903.89	1,019.32	95.60	143,808.29	13,302.25	
14	2/1/93	143,808.29	1,018.64	96.28	143,712.01	14,320.89	
15	3/1/93	143,712.01	1,017.96	96.96	143,615.05	15,338.85	
16	4/1/93	143,615.05	1,017.27	97.65	143,517.40	16,356.12	
17	5/1/93	143,517.40	1,016.58	98.34	143,419.06	17,372.70	
18	6/1/93	143,419.06	1,015.89	99.03	143,320.03	18,388.59	

Figure 6-2: Borders and Shading Appropriate use of cell borders and shading can make a spreadsheet easier to read and use. In this Claris Resolve spreadsheet, top and bottom cell borders separate each line of the loan-amortization table, lessening the chance that a reader's eyes will skip to an adjacent row as they scan from left to right. Colored shading helps highlight key areas of the spreadsheet.

QUICK TIPS

Customizing Excel's Toolbars

If you use Excel, customize the program's toolbars to reflect the commands and options you use most. It's easy: Simply choose Toolbars from the Options menu, click the Customize button, select a tool category, and then drag the tools to the appropriate toolbars.

If you're into macros, check out the Custom category of tools (click the Customize button, and then select the Custom option in the Categories box). This category is a collection of miscellaneous tools to which you can assign your own macros — click a tool, and its macro runs.

To reset the toolbars to their default (original) settings, choose Toolbars and click the Reset button.

Automatic Updating with Publish and Subscribe

In the last chapter, I showed how to move some spreadsheet cells or a graph into another program using the Mac's Clipboard. The Clipboard is straightforward, but it has a big limitation: If the data changes in the originating program — in this case, if your spreadsheet figures change — you need to repeat the copy-and-paste routine in order to bring the latest version into your word processor or publishing program.

QUICK TIPS

Another Way to Create Links Between Word and Excel

The Step-by-Step box "Publishing and Subscribing," later in this chapter, shows one technique for creating a link between Excel and Word. You can also use Word's Paste Special command. In the Paste Special dialog box, select the Excel option, and then click the Paste button. Thereafter, you can edit the spreadsheet by double-clicking on the cells you pasted. (You'll need at least 4MB of memory to run both Word and Excel at the same time.) When you return to Word, you'll see that it has automatically updated the document to reflect your edits.

This technique relies on a data-exchange system called object linking and embedding, or OLE for short. For details on OLE, see Chapter 28.

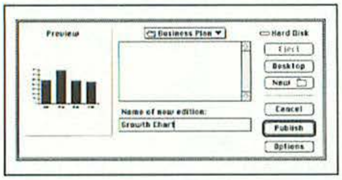
System 7's publish and subscribe features enable you to quickly update the word-processed or desktop-published document if the original spreadsheet changes. Excel, Lotus 1-2-3, and Resolve support publish and subscribe (so do ClarisWorks and Symantec's GreatWorks integrated packages). If you use a word processor or publishing program that also supports publish and subscribe, you can use its Subscribe To command to include published cells or graphs in your documents, as shown in the Step-by-Step box "Publishing and Subscribing."

And as I mentioned in the previous chapter, the graphs that spreadsheet programs create are actually object-oriented graphics you can modify using programs such as Claris MacDraw II or Pro, Adobe Illustrator, and Aldus FreeHand. Paste a graph into an illustration program, and you can embellish it using its drawing tools. I'll show you how in Chapter 13.

STEP-BY-STEP

Publishing and Subscribing

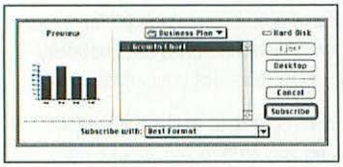
If you use Apple's System 7 software, you can create links between a spreadsheet or graph and a document created in a word processor or any other program that supports System 7's publish and subscribe features. The instructions in this box show how to include a graph from Lotus 1-2-3 or Microsoft Excel in a Microsoft Word document.



Name of new edition: Growth Chart

To publish the graph:

1. **Select the graph you want published.**
2. **Choose Create Publisher from the Edit menu.**
   In 1-2-3, this command is in the Edit menu's Publishing submenu. The Create Publisher dialog box appears.
3. **Type a name for the edition file (the graph) and then click Publish or press Return.**
   The graph is published.



Subscribe with: Best Format

To bring the published graph into Microsoft Word:

1. **Choose Subscribe To from the Edit menu.**
   The Mac automatically selects the edition file you just created and shows a preview of it.
2. **Click Subscribe or press Return.**
   The graph appears in the Word document. To change the way the graph is updated when it or its underlying data changes, use Word's Subscriber Options dialog box or the Publisher Options dialog box in 1-2-3 or Excel. These dialog boxes let you specify when and how Word should receive an updated version of the graph.

CHAPTER 6 CONCEPTS AND TERMS

- Instead of typing cell addresses by hand when creating formulas, use the cell-pointing feature that all spreadsheet programs provide.
- Excel, Lotus 1-2-3, and Resolve enable you to assign descriptive names to cells and cell ranges. You can take advantage of this to create more descriptive formulas and quickly go to different sections of a spreadsheet.
- Choosing the appropriate number format (a currency format that uses two decimal places), and adding cell borders can make a spreadsheet easier to read and more meaningful.
- With System 7's publish and subscribe feature, you can establish links between spreadsheet documents and documents you're working on in other programs that automatically update tables or graphs when the underlying spreadsheet data changes.

border
A line on one or more edges of a spreadsheet cell.

cell pointing
Adding cell addresses to formulas by pointing with the mouse pointer or the arrow keys instead of typing the cell addresses manually.

data series
A list of incrementing or decrementing data, such as the sequence of numbers from 1 through 10 or the months of the year.

fill handle
In Microsoft Excel, the small black box at the lower-left corner of a selected cell. By pointing to the fill handle and then dragging into adjacent cells, you can repeat the values in the selected cell or create a data series.

naming
Assigning a descriptive name, such as QuarterlySales, to a cell or range of cells. If you name a cell or range of cells, you can refer to the name in formulas, thereby making the formulas easier to understand.

object linking and embedding
Abbreviated OLE, a method of establishing links between two documents (or between parts of one document) in certain Microsoft products and in Aldus PageMaker 5.

toolbar
In Microsoft Excel, a window containing buttons that perform various tasks when clicked.

CHAPTER SEVEN

Database Management Basics

IN THIS CHAPTER

- Learning the basics of database management
- Working with fields and records
- Sorting a database and searching for information
- Choosing between a flat-file or relational database
- Customizing fields and layouts in Claris File-Maker Pro
- Managing scanned images, illustrations, and QuickTime movies with database programs

Life is filled with facts to file. In any office, near the "You don't have to be crazy to work here, but it helps" sign, file cabinets entomb paper that has run the course from in-box to out-box. Rolodex files swell with cards, and Post-it notes spread like moss on the surfaces of overcrowded folder holders. "While you were out" messages stack up in corners, each one a clear reminder of *why* you were out.

If this describes your workplace, the notion that a computer can get you organized and keep your head above paper can be enticing enough to inspire a purchase. But this inspiration is often built on the vague idea that computers have miraculous powers of organization, that putting one on your desk somehow gives you one-key access to those tedious tidbits you have to root for now.

Speed, disk storage, and eraserless revisions do give a computer powerful filing capabilities — when they're tapped by a *database manager*. These electronic file clerks let you store, sort, retrieve, revise, and print information. You can store an entire file drawer of facts and figures on a floppy disk, and locate any one of them in the time it would take you to open the drawer.

ON THE CD

- Claris FileMaker Pro and ClarisWorks
- Imspace Systems' Kudo Image Browser
- Attain Corporation's In Control
- Address Book (in The Best of BMUG collection)

But a database manager isn't a panacea for organizational ills. For one thing, a computer database can't create itself. You have to decide how to organize your information and then set up the database manager accordingly. And information doesn't file itself in a database; you (or someone else, if you're lucky) have to set aside time for the tedious task called *data entry*. A database may enable you to effortlessly retrieve files, but it requires endless maintenance.

Variations on the Database Theme

Every database manager handles the details of field formatting and range checking in its own way, but most database managers work within the standard framework of fields and records. There are some interesting exceptions. Foremost among them is HyperCard, a version of which Apple used to include with the Mac. As I show you in Chapter 20, HyperCard is much more than just a database manager; its customizeable capabilities to sort, search, and store have caused many Mac users to embrace HyperCard.

If you want to replace your Rolodex with something electronic, check out a program such as Power Up Software's Address Book Plus, Portfolio Systems' DynoDex, Pastel Development's DayMaker, Advanced Software's In Touch, or After Hours' TouchBase. All are simple data managers that can also dial the phone for you (provided you have a modem). Many programs include small binders you can use to create hard-copy versions of your address book. Several free or shareware address book programs are also available.

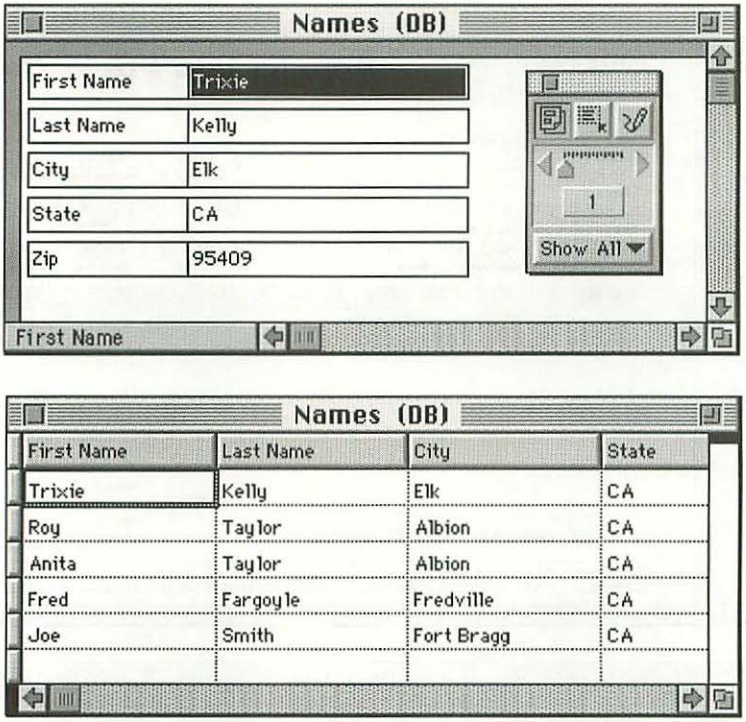
To manage your time as well as your data, consider Visionary Software's First Things First or After Hours' DateBook. Both programs enable you to set up schedules and print daily to-do lists in a variety of formats.

For publishers and multimedia producers, managing a hard drive containing images, QuickTime movies, and digital sounds can be more of a challenge than managing client databases or schedules. If you're in this group, you may want to consider one of the new breed of so-called *mixed-media* databases such as Aldus Fetch. These programs enable you to catalog, browse, and retrieve illustrations, sounds, clip art, and QuickTime movies. You can create media categories — Outdoor Scenes, Background Music, Sound Effects, and Politicians — and then organize your graphics and multimedia files according to those categories. You can find more details on these multimedia databases in Chapter 14.

Data Basics

Unlike a file folder, database managers don't let you stuff information anywhere just to get it out of sight. They hold data within a rigid structure, and planning that structure is the most important step in setting up your database. You can reorganize an electronic database after you've entered data, but it's not much easier than reorganizing a paper filing system.

A database structure is formed by two building blocks — *fields* and *records.* A field is a single piece of information for an entry; together, the fields for an entry make up the record (see Figure 7-1 "A Matter of Record"). In a database version of a Rolodex, for example, all of the information on a single card is a record and each element — first name, last name, company, zip code — is a field. When you define a database's structure, you create fields and give each one a name that reflects its contents, such as First Name or Street Address.



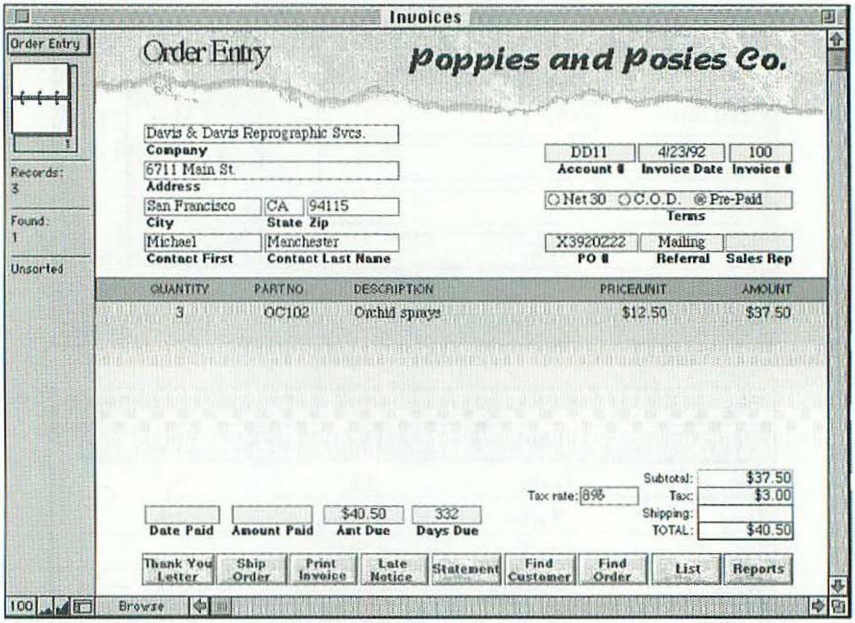
First Name	Trixie
Last Name	Kelly
City	Elk
State	CA
Zip	95409

First Name	Last Name	City	State
Trixie	Kelly	Elk	CA
Roy	Taylor	Albion	CA
Anita	Taylor	Albion	CA
Fred	Fargoyle	Fredville	CA
Joe	Smith	Fort Bragg	CA

Figure 7-1: A Matter of Record In a database, a field is a single piece of information for an entry; together, the fields for an entry make up a record. The window (top) shows a single record from a Microsoft Works database. The window (bottom) shows five records displayed in a spreadsheet-like, row-and-column format.

In addition to defining the structure, creating a database involves specifying how information will be presented on screen. The screen layout of fields and their names is called a *form.* Most programs provide a preset, quick-and-dirty form layout to use when you just can't wait to start entering data. Many programs also let you design your own forms to mimic the paper forms you're trying to avoid. Macintosh database managers tend to offer more design options than a decorator supply house, enabling you to choose fonts and styles, draw lines and boxes, and add graphics, such as company logos (see Figure 7-2 "In Fine Form").

Many database managers also let you view and enter data in a spreadsheet-like, row-and-column format. This *table view* can be a good way to step back for the big picture — it's like looking at a baseball card team photograph instead of having to paw through each player's card separately. Programs that provide a table view (also called a *columnar view*) include Claris FileMaker Pro, ClarisWorks, and Microsoft Works.



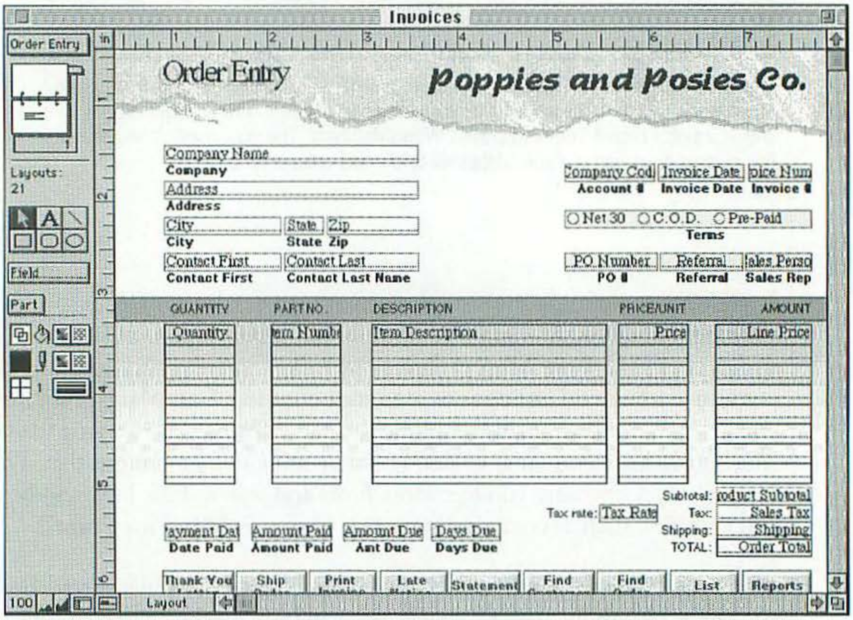
Records: 3
Found: 1
Unsorted

Company: Davis & Davis Reprographic Svcs.
Address: 6711 Main St
City: San Francisco
State: CA
Zip: 94115
Contact First: Michael
Contact Last Name: Manchester
Account #: DD11
Invoice Date: 4/23/92
Invoice #: 100
Terms: ○ Net 30 ○ C.O.D. ● Pre-Paid
PO #: X3920222
Referral: Mailing
Sales Rep:

QUANTITY	PARTNO	DESCRIPTION	PRICE/UNIT	AMOUNT
3	OC102	Orchid sprays	$12.50	$37.50

Tax rate: 8%
Subtotal: $37.50
Tax: $3.00
Shipping:
TOTAL: $40.50

Date Paid:
Amount Paid:
Amt Due: $40.50
Days Due: 332



Company: Company Name
Address: Address
City: City
State: State
Zip: Zip
Contact First: Contact First
Contact Last Name: Contact Last
Account #: Company Cod
Invoice Date: Invoice Date
Invoice #: oice Num
Terms: ○ Net 30 ○ C.O.D. ○ Pre-Paid
PO #: PO Number
Referral: Referral
Sales Rep: ales Perso

QUANTITY	PARTNO	DESCRIPTION	PRICE/UNIT	AMOUNT
Quantity	em Numb	Item Description	Price	Line Price

Tax rate: Tax Rate
Subtotal: oduct Subtotal
Tax: Sales Tax
Shipping: Shipping
TOTAL: Order Total

Date Paid: ayment Dat
Amount Paid: Amount Paid
Amt Due: Amount Due
Days Due: Days Due

Figure 7-2: In Fine Form Many Mac database managers provide layout features that let you create sophisticated forms for data entry and reporting. The invoice form (top) was created using the powerful form-design features in FileMaker Pro. The window (bottom) shows the form in FileMaker Pro's Layout mode and the tools on the left for drawing shapes and creating text items. Also note the rulers for aiding in precise positioning.

Different Fields for Different Yields

Database managers provide different types of fields for different kinds of information. All data managers offer two basic field types. *Text fields* hold letters, numbers, and any other keyboard character. Number, or *numeric fields* hold numeric values — an employee's hourly wage in a personnel database, or a balance-due value in an accounting database.

Most data managers provide additional field types. *Date fields* hold only date values. *Picture fields* hold graphics that you paste in from the Clipboard. *Logical fields* hold only one of two values — yes or no. For example, you may create a logical field called Past Due, which would indicate whether a client's account was paid up. *Formula fields* obtain their values not from the keyboard, but by processing values in other fields according to a formula you specify. An example of a formula field is a Gross Pay field that multiplies the value in an Hours Worked field by that of an Hourly Wage field.

Checking your accuracy

One way to improve your accuracy in data entry is to use a program that lets you assign *range checking* values to fields. You may specify, for example, that an error message be displayed if someone enters only five digits in a Social Security Number field. If your company opened in 1993, you could tell the data manager to reject employee hire dates earlier than January 1,1993.

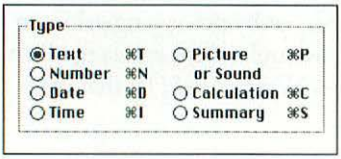
If text fields can hold any character, why are there special fields for numbers, dates, and yes or no values? One reason is to guard against inaccuracy. Most database managers won't let you store a text value in a number field, and will, therefore, thwart someone typing a lowercase letter *l* for the number 1, or an uppercase letter *O* for a zero. Having numeric fields also simplifies generating totals and subtotals in reports.

Choosing and changing field types

Choosing the right field types is especially important for fields that will hold numbers or date values. Although you can store numbers or dates in a text field, it isn't a good idea. Most data managers can apply calculations to the values in a number field — adding a sales tax percentage to a subtotal to arrive at a grand total, for example — but they can't calculate numbers stored in a text field.

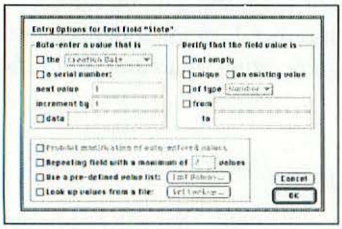
Basic Data Management in FileMaker Pro

Its straightforward operating style, excellent form-layout features, and speed have made Claris' FileMaker Pro the top-selling Macintosh data manager for some time. In 1992, Claris shipped a PC version of FileMaker Pro that runs under the Microsoft Windows environment and can share databases with its Mac cousin. This box shows how to specify field types, add error-checking options, and create buttons and scripts in FileMaker Pro.



To specify a field type:

1. **Choose Define Fields from the Select menu.**
   If you're creating a new database, you don't have to perform this step — the Define Fields dialog box appears automatically.
2. **To change an existing field's type, select it.**
3. **In the Type section of the Define Fields dialog box, click the desired field type.**
   You can also press ⌘ along with a letter, as shown at left.
4. **If you changed an existing field, the Change button is highlighted. Click it or press Return.**
   Depending on the field type you specified, a message may appear warning you that some or all data in that field will be lost.
5. **When you've finished defining, creating, or customizing fields, click Done.**


Entry Options for Text Field "State"
Auto-enter a value that is
☐ the Creation Date
☐ a serial number:
next value 1
increment by 1
☐ data
Verify that the field value is
☐ not empty
☐ unique ☐ an existing value
☐ of type Number
☐ from
to
☐ Repeating field with a maximum of values
☐ Use a pre-defined value list:
☐ Look up values from a file:
Cancel
OK

To specify a range, a list of choices, or other data-entry options for a field:

1. **When defining the field, click the Options button. If you've already defined the field, select it and then click Options.**
   The Entry Options dialog box appears.
2. **Select the appropriate options as described in the following table.**

To...	*Select...*	*And Then...*
Have FileMaker Pro automatically enter data	One or more auto-enter options	Specify the type of information to enter
Have FileMaker Pro "proofread" entries	One or more verify options	Specify additional options, such as Type (number, date, time) or a range (From and To)

(continued on the next page)

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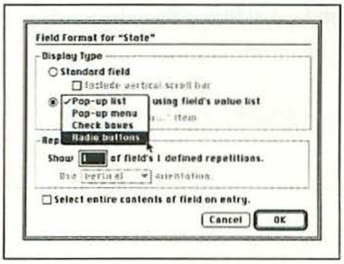
To...	*Select...*	*And Then...*
Restrict data entry to a fixed number of choices	The box labeled "Use a pre-defined value list"	Type each value, pressing return after each one
Have FileMaker Pro enter values from another file when certain conditions are met	The box labeled "Look up values from a file"	Select the file, and then specify the conditions in the Lookup dialog box


Field Format for "State"

Display Type

○ Standard field

☐ Include vertical scroll bar

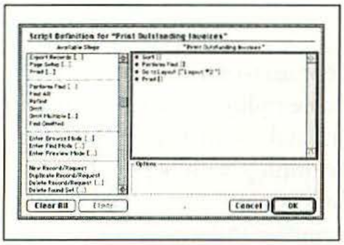
● Pop-up list using field's value list

Show 1 of field's 1 defined repetitions.

☐ Select entire contents of field on entry.

To create radio buttons or check boxes for a field based on a list of values:

1. **If you haven't already, use the Define Fields dialog box to specify the list of values for the field.**
2. **Switch to layout mode by choosing Layout from the Select menu.**
3. **Select the field you want to modify by clicking it once.**
   If you double-click the field, the Text Format dialog box appears. Click Cancel and repeat step 3.
4. **Choose Field Format from the Format menu.**
   You can also press ⌘-Option-F. The Field Format dialog box appears.
5. **Choose the desired element (buttons, check boxes, and so on) from the Display Type pop-up menu.**
6. **Click OK or press Return.**


Script Definition for "Print Outstanding Invoices"

To create a script:

1. **Choose ScriptMaker from the Scripts menu.**
2. **Type a name for the script.**
   Use a descriptive name that reflects the script's purpose, such as *Print Outstanding Invoices.* If you don't want the script to appear in the Scripts menu, uncheck the Include in Menu box.
3. **Click the Create button or press Return.**
   The Script Definition dialog box appears.
4. **Specify the steps you want the script to perform by double-clicking them in the Available Steps box.**
   You can change the order in which a step appears by pointing to the up-and-down pointing arrows next to the step and then dragging.
5. **Click OK or press Return.**
   The Define Scripts dialog box reappears.
6. **To define another script, return to step 2. Otherwise, click Done.**

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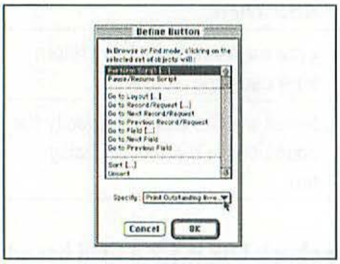


In Browse or Find mode, clicking on the selected set of objects will:

Specify: Print Outstanding Inve...

To assign a script to a button:

1. **Choose Layout from the Select menu.**
2. **Create the new button by drawing a square and then typing the button's name within it.**
3. **Select the button and choose Define Button from the Scripts menu.**

   The Define Button dialog box appears.
4. **Click the Perform Script option, and then select the desired script's name from the pop-up menu.**
5. **Click OK or press Return.**

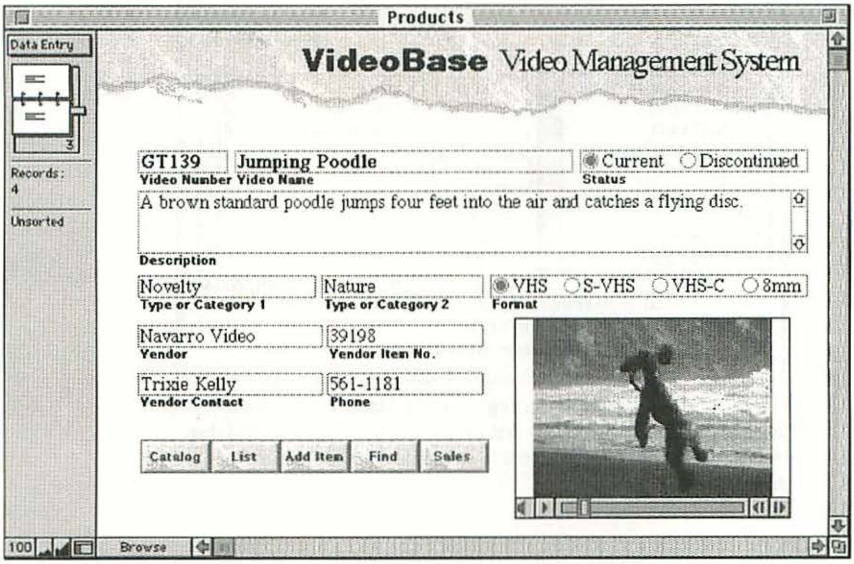
   At this point, you may want to switch back to Browse mode and try the new button.

Can you change a field's type if you realize that, say, a text field really should be a date field? Generally, yes, but depending on the program you use — and the change you're proposing — you may lose some or all of the data in that field. The best way to eliminate field-conversion worries is to think about each field's type before you start entering data.

Sorting Out Your Data

Using appropriate fields is also important when it comes to sorting data. Say you want to sort an employee database according to each employee's date of birth. If you stored the birth date values in a text field, your database manager would place values beginning with December ahead of those beginning with September, because *D* precedes *S.* A date field knows better. When you use a date field, the program recognizes that September precedes December, and sorts your records accurately.

A database manager's capability to sort information in alphabetic or numeric order makes your data more useful by letting you look at it from different perspectives. In a personnel database, you can view a list of employees sorted according to salary, date of hire, or number of sick days taken. You can view a database of videotapes according to title, star, running time, or genre (see Figure 7-3 "Filing Movies").



Video Number: GT139

Video Name: Jumping Poodle

Status: ● Current ○ Discontinued

Description: A brown standard poodle jumps four feet into the air and catches a flying disc.

Type or Category 1: Novelty

Type or Category 2: Nature

Format: ● VHS ○ S-VHS ○ VHS-C ○ 8mm

Vendor: Navarro Video

Vendor Item No.: 39198

Vendor Contact: Trixie Kelly

Phone: 561-1181

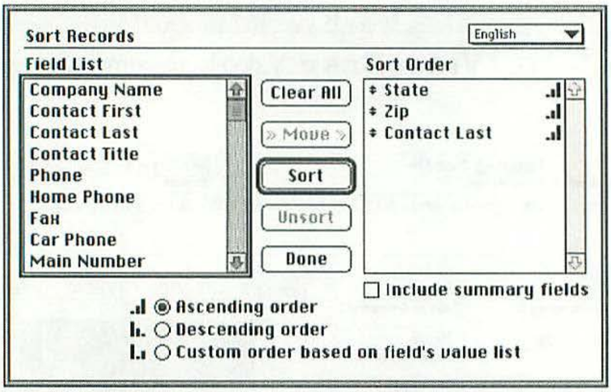
Figure 7-3: Filing Movies This FileMaker Pro database stores information about videos, with a picture field holding QuickTime movie clips. To import a movie into a database, choose Import Movie from the File menu's Import/Export submenu.

But what if you want to view an employee list organized by salary within each department, or an alphabetized list of horror movies presented in the order they were made? That's where sorting levels come in. Most database managers let you sort data according to multiple levels: last name, then first name; last name, first name,

QUICK TIPS

When Is a Zip Code Not a Number?

When creating a database for addresses, many people make the mistake of using a number field to hold zip codes. The problem is, eight states (as well as Puerto Rico) have zip codes that begin with 0, and a number field generally lops off a leading zero, leaving you with just the last four digits. Many non-U.S. postal codes also contain a mishmash of letters and numbers. The moral: Use a text field for zip codes. Doing so enables you to enter a hyphen if you're one of the few people in the world who actually use nine-digit zip codes.



Sort Records

Field List

- Company Name
- Contact First
- Contact Last
- Contact Title
- Phone
- Home Phone
- Fax
- Car Phone
- Main Number

Sort Order

- State
- Zip
- Contact Last

☐ Include summary fields

● Ascending order

○ Descending order

○ Custom order based on field's value list

Figure 7-4: New Levels of Sorting This FileMaker Pro database is being sorted on three levels — first by state, then by zip code, and then by last name. The rising bars next to each field name denote an ascending (A–Z) sort.

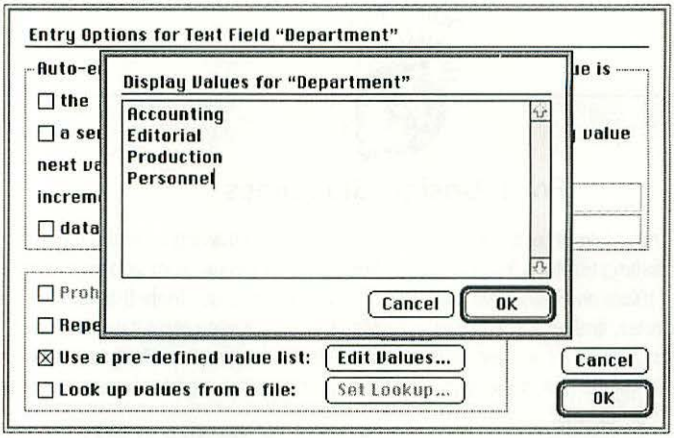
according to hire dates, and according to department; last name, first name, according to age group and income, and sorted by city. Multiple sorting levels multiply the angles from which you can view your data (see Figure 7-4 "New Levels of Sorting").

Accuracy Counts

A database is only as useful as it is accurate. A typographical error in a field can cause a record to be sorted incorrectly or not found during a search. And if the field contains numbers — an employee's hourly wage, an item's price, or the number of widgets in stock — the inaccuracy can cost you money. No database manager can ensure 100-percent accuracy, but most programs have features that guard against certain kinds of mistakes, making it easier to enter frequently used information.

Entry checking features are data-entry proofreaders that compare what you enter to a list or range of acceptable values. Say you're creating a personnel file containing a Department field. If your company has four departments, you can specify that the program reject anything other than their names (see Figure 7-5 "Labor Savers").

Many programs also let you specify *input patterns*, series of characters that affect text you type. For example, an input pattern for a telephone number field may read (nnn) nnn-nnnn. When you enter data into a field with this pattern, you can simply type ten numbers and the data manager inserts the parentheses and hyphen for you. And if you type more or fewer than ten numbers — or throw in some letters — the program lets you know.



Entry Options for Text Field "Department"

Display Values for "Department"

Accounting
Editorial
Production
Personnel

☒ Use a pre-defined value list:

☐ Look up values from a file:

Figure 7-5: Labor Savers FileMaker Pro is among the database managers that let you specify a list or range of acceptable field values. Here, four departments are being specified for a file named Departments.

A cousin to entry checking is *range checking* — ensuring that numbers or dates are within a specified range. If you know the price of a Type A Widget is always between $10.95 and $12.95, you can assign that range to the Price field. Attempting to enter a price outside that range earns you an error message.

In many databases, the contents of certain fields stay the same from one record to the next. (Most of a company's employees live in the same state, for example.) To streamline data entry, most programs can enter data into certain fields for you when you create a new record. Most programs can also carry over information from corresponding fields in the previous record.

For those times when the data differs, you can replace automatically entered data by simply backspacing over it. ProVUE Development's Panorama II boasts a love-it-or-hate-it feature called clairvoyance — if you type San F and a previous record contains San Francisco, the program inserts the rest of the text for you. You can override the guess by simply continuing to type. You can also turn the feature off when you don't feel like having fields finished for you.

Certain types of fields — ones that list marital status, sex, or whether an account is past due — contain one of only two possible values. Other types of fields are based on a rigid list of values — such as the list of colors available for Type A Widgets or the expense categories in a budget database. Most database programs enable you to specify these kinds of restrictions, and to select a value from a list of options by clicking on-screen buttons or check boxes. Use these multiple-choice features to improve accuracy and eliminate the drudgery of repeatedly typing the same values.

QUICK TIPS

Form Design Guidelines

Mac database managers have layout features that encroach on desktop publishing territory. You can find on-screen measuring rulers and T-squares, and tools for drawing lines, circles, and boxes. You can also add text and graphics such as a company name and logo. And you can change the font, style, and size in which fields and labels appear.

All these layout tools also make it easy to create visually busy database forms. Graphically tasteless forms won't present your data in its best light, and they'll make data entry — never a picnic anyway — more arduous.

Because most data managers let you create numerous forms and switch between them, I recommend creating separate forms for data entry and for printing. Make the data-entry forms simple, without a lot of extraneous text and graphics. If several people are entering data, consider including some brief help text to guide less-experienced users through the process.

If possible, position fields so that you can review data and move between fields without having to scroll; besides showing an entire record at once, this helps prevent people from skipping over fields they couldn't see. And use fonts that are designed for the Mac's limited screen resolution, such as New York and Geneva. Laser printer fonts such as Times and Helvetica aren't as legible on the Mac's screen.

For forms that you will print on a laser printer, the opposite applies — avoid "city-named" fonts such as New York, Chicago, and Geneva. They don't laser-print well. Many graphic designers recommend sturdy, san-serif fonts such as Helvetica and Franklin Gothic for forms (see Chapter 12 for more advice on choosing fonts for forms).

Position fields to take advantage of the paper size you're using; because scrolling isn't an issue for printing, don't let yourself be hemmed in by the size of the Mac's screen. If you're printing on preprinted forms such as invoices or label stock, use your program's rulers to position items so they appear in the proper place. Throw in some graphic embellishments if you like; let your creative juices flow — but not gush.

Golden Retrievers

Unlike the file cabinets I have known, a database manager doesn't teleport information it receives into the Twilight Zone. When you want to find something, you can do so in a few ways.

Just browsing

The simplest way to move around in a database is by browsing — moving from one record to the next, either to view the records you just sorted, or to admire how much better they look on a screen than in a box of index cards. When you locate the record you want, you can alter it or just move on to the next.

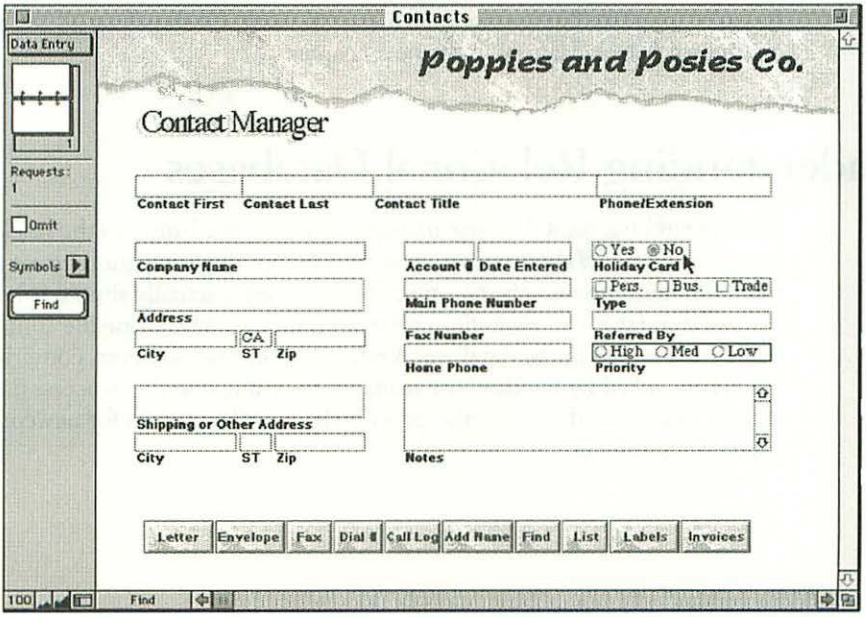
Specifying your search criteria

When you're looking for something specific instead of just browsing, you use what are called *search specifications* or *search criteria* — phrases that tell your database manager what to look for. A search can be simple ("find Dave Byrd's record") or complex ("find all married male employees in accounting earning more than $35,000 but less than $50,000").

When you perform a complex search, you use *search operators* — characters like the greater-than and less-than signs (> and <) — to find entries above or below a certain value. You also use the *logical operators* AND, OR, and NOT to combine search criteria. In the complex search example, the logical AND appears twice: "Find all employees whose Sex field is male AND whose Department field is accounting AND whose Salary field is greater than 35,000." With the logical AND, all the criteria must be true for a given record to be considered found. With a logical OR, only one need be true: "find all clients in Minneapolis OR St. Paul."

Simplifying complex searches

Fortunately, complex searches aren't complex to conduct. Most Mac database managers provide dialog boxes that make performing complex searches a matter of clicking the desired options, typing the data you're looking for, and then clicking OK (see Figure 7-6 "Search for Data").



ST: CA

Holiday Card: ○ Yes ● No

Figure 7-6: Search for Data Most Mac data managers let you search for data by typing the values you're looking for in the appropriate fields. Here, a FileMaker Pro search is being specified for all contacts in California that did not receive a holiday greeting card.

Reporting the results of a search

The result of all this searching is usually a *report,* a printed copy of the records meeting your search criteria, sorted in a specific order. Although a report can be a form that shows just one record, it's more typically a *columnar report* showing many records, with each field in its own column and each record in its own row, like baseball team standings or stock exchange tables.

Merging the Mail

How does Ed McMahon find time to personally address those publisher's giveaway mailings? He's discovered *mail merge,* a variation on the reporting theme that involves merging a stock form letter with a database to produce "personal" form letters. Mail merge is often performed with powerful word processors like Microsoft Word, but a database manager that lets you create lengthy text items on a form can also do the job.

With mail merge, you first type the stock portion of a letter, inserting field names where the custom text will appear. Using *conditional statements* such as IF...THEN, you can create different letters based on information in the database — congratulating clients with paid-up accounts, or telling clients whose accounts are overdue to reach for their checkbooks.

If you're interested in putting mail merge to work, I'll show you all the gory details (except for Ed McMahon) in the next chapter.

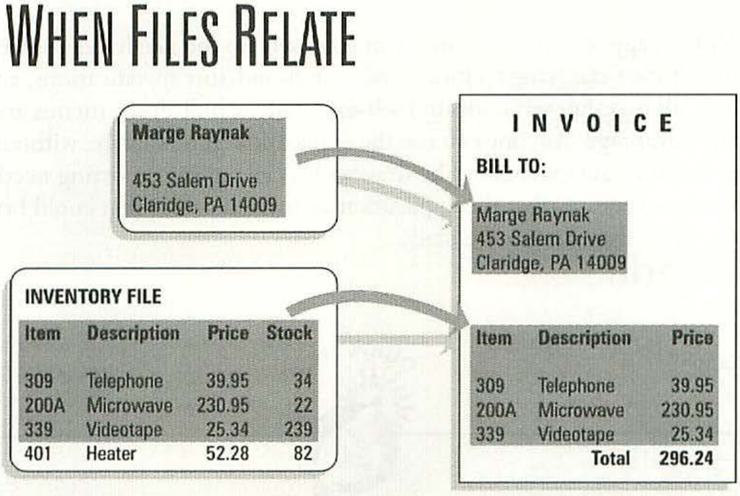
Understanding Relational Databases

When searching for a database manager, you run head-on into the brick wall known as *relational database management.* Though the term causes great confusion, the difference between the two types of databases is actually simple. The type I've discussed so far is the *single-file,* or *flat file,* database, where one file contains all the fields and records in the database. A *relational database,* however, comprises two or more files linked by the database manager to enable one file to access data in the others. Relational databases also provide the most headaches for newcomers to computer databases.

Comparing single-file and relational databases

Unlike a single-file database, a relational database isn't easily compared to a real object like an index-card file. If you squint and pretend, however, you can compare it to a cross-referenced filing system. In such a system, an employee's personnel entry may say "see the payroll file for this employee's salary history." In the payroll file, each employee salary history could be accompanied by a note saying "see the personnel files for this employee's address and Social Security number." By cross-referencing the two files, you eliminate the need to store each employee's address and Social Security number in the payroll file and the need to store payroll information along with the personnel history (see Figure 7-7 "When Files Relate"). Elimination of redundancy is a relational database's strong suit.

Another relational-database plus is that cross-referencing is automatic. An employee's address and Social Security number can appear on screen next to his or her payroll information. When employees leave, you can expunge all references to them by deleting their records in just one file.



INVENTORY FILE

Item	Description	Price	Stock
309	Telephone	39.95	34
200A	Microwave	230.95	22
339	Videotape	25.34	239
401	Heater	52.28	82

INVOICE

Item	Description	Price
309	Telephone	39.95
200A	Microwave	230.95
339	Videotape	25.34
	Total	296.24

Relational database managers combine data from more than one file. Here, an address from a client address file is combined with information from an inventory file to produce an invoice. The invoice total can be generated by a formula field.

Figure 7-7: When Files Relate

Choosing the right database for the job

But these strengths don't mean that every data-management task demands a relational program. Unfortunately, there is no sharp boundary separating single-file applications from multifile applications, so deciding when to make that leap can be difficult. As a rule, consider a relational data manager such as ACI's 4th Dimension or Microsoft's FoxBASE+/Mac when the data you're storing can be used in more than one way, or when you find that you're entering the same information in separate files. If those programs are too daunting (and they can be), consider Claris' FileMaker Pro. Technically speaking, FileMaker Pro is a flat-file database manager; however, it provides a lookup feature that enables one file to access data in another. And it's far easier to learn and use than a full-blown relational program.

Generating custom database applications

At the head of the relational data management class are *application generators*, programs that enable you to create data-management applications tailored for specific tasks such as inventory management or client billing. Such applications, often custom designed for a single company, enable people who don't need to understand the technicalities of data management or file structures to use the information on the database.

With an application generator, someone sets up the needed file structures, relationships, range-checking routines, and search-and-sort specifications, and then ties them all together with (ideally) self-explanatory pull-down menus and dialog boxes. The advantage: Anyone can use the application immediately, without having to master the data manager. The drawback: A change in reporting needs or business practices requires that the application be modified, and that could bring work to a halt while the changes are made.

Creating Your Own FileMaker Help Screens

A polished program provides its own on-line help screens, and so can your FileMaker Pro database. Simply create a new layout, and instead of putting fields on it, put several paragraphs (or more) of help — advice for using your reports or scripts, tips for searching or sorting, or reminders for data entry. Name your layout *Help,* and users can view your on-line help by choosing its name from the layout pop-up menu. Many of the sample databases included with FileMaker Pro use this technique.

Database Shopping Tips

Before shopping for a database manager, first assess the way you work with information now, and then try to find the program that makes the transition to electronic filing as smooth as possible. If you need to create data entry forms that resemble their paper counterparts, you need a program with complete form-layout features, such as FileMaker Pro.

For complex accounting or inventory applications, a relational program such as 4th Dimension or Microsoft's FoxBase is in order. For maintaining a mailing list, a simple filer such as Software Discoveries' RecordHolder Plus may be all you need. For simple mail merge tasks, consider an integrated program such as ClarisWorks or Microsoft Works.

Spreadsheets as databases

As I mentioned in Chapter 5, spreadsheet programs make serviceable database managers, thanks to their sorting and searching features and their libraries of functions for manipulating data. But where most true database managers enable you to store as much data as will fit on disk, most spreadsheets enable you to store only as much as will fit in memory. Try to maintain a huge database using a spreadsheet program, and you risk running out of memory or at the very least, slowing the spreadsheet program to a crawl.

Most spreadsheets also lack the built-in error checking features that data managers provide. You can construct error-checking routines yourself by creating formulas, but if you have to resort to that, you are probably better off with a database manager to begin with.

QUICK TIPS

Flashier Buttons in FileMaker Pro

This chapter's Step-by-Step box showed you how to create a simple button by drawing a rectangle and then typing the button's text within it. If you want to dress up your database with flashier-looking buttons, copy one of the button designs from the Buttons template included with FileMaker Pro, and then paste it into the desired form when in Layout mode. Or, draw your own graphic and import it.

Is a database manager for you?

A database manager can streamline your filing, provided you realize it isn't a surefire cure for disorganization. If you learned filing from Oscar Madison, that slob's slob of a sportswriter from the Odd Couple, your records will be as disorganized electronically as they were on paper.

Some tasks are better handled on paper. Flipping through Rolodex cards is still often faster than typing search criteria. And until the Mac has a sauce-proof keyboard, recipes belong in card files and cookbooks. Don't try to shoehorn the computer into areas of your filing life that work efficiently now. Even Oscar Madison always knew which dirty sock held the witty, poignant conclusion he planned to use next time he got the chance.

Pardon me while I check my laundry basket.

CHAPTER 7 CONCEPTS AND TERMS

- A database allows easy storing, sorting, retrieving, revising, and printing of information, but it requires careful advance planning and frequent maintenance.
- Databases provide a variety of field types. Text fields hold text or numbers, number fields hold only numeric values, date fields hold date and time values, logical fields hold yes/no values, and picture fields hold graphic images.
- Choosing the appropriate field types when setting up a new database helps ensure accuracy when entering data and sorting.
- You can locate data in a database by browsing (moving from one record to another) or by typing specific search criteria.
- In a flat-file database, one file holds all the fields and records in the database. In a relational database, two or more files are linked by the database manager to allow one file to access data in others.

application generators
Programs such as Acius' 4th Dimension enable you to create data-management applications tailored for specific tasks such as inventory management or client billing, complete with their own dialog boxes and pull-down menus.

entry checking
A data-entry feature in which the database program restricts what you enter to a list or range of acceptable values.

field
A single piece of information for an entry, such as a person's last name or street address.

flat-file database
The most common type of Macintosh database, in which one file contains all the fields and records in the database.

form
The on-screen or printed layout of fields and their names with optional fixed text, graphics, lines, and other embellishments.

formula field
A field that obtains its values not from the keyboard, but by processing values in other fields according to a formula you specify.

input pattern
A series of characters that you specify in order to restrict the format of data in a particular field. For example, a State field may have an input pattern that enables only two capital letters to be entered.

mail merge
The process of combining or merging a stock form letter with a database to produce "personal" form letters.

range checking
A data-entry feature in which the database program ensures that data you enter is within a specific range.

record
A collection of fields for a single entry, such as a person's name and address.

relational database
A database consisting of two or more files linked by the database manager in a way that enables one file to access data in the others.

report
A printed copy of the records that meet your search criteria, often sorted in a specific order and enhanced with totals, subtotals, and other summary information.

search criteria
Information you specify to tell the database manager what you're looking for. You can combine criteria by using logical operators such as AND, OR, and NOT.

search operators
Characters, such as the greater-than and less-than signs (> and <), that tell the database to look for values or dates greater than, less than, equal to, or not equal to the search criteria you specify.

table view
A spreadsheet-like, row-and-column display format that shows numerous records at once.

CHAPTER EIGHT

Managing Mail Merge

IN THIS CHAPTER

- Creating and customizing form letters and other documents
- Preparing a FileMaker Pro database for mail merge
- Using mail merge in Microsoft Word, WordPerfect, and WriteNow
- Merging documents with ClarisWorks and Microsoft Works

Dear <name:> If you're like many <job title,> you've compiled a database of customers who use your <product.> Now and then, you want to notify them of a <sale/special offer.> Or perhaps you want to inform them that their accounts are <paid up/past due.> In any case, if you want your letters to be personally addressed — none of that *Dear valued customer* stuff — you're a candidate for *mail merge.*

Mail merge is the science behind all those publisher's sweepstakes mailings, magazine subscription offers, and check-up reminders from your dentist. Mail merge, also called *print merge,* is the process of combining or merging information from a database program with a text document. The text document, usually created in a word processor, contains the letter's boilerplate text — the stuff that doesn't change from one recipient to the next. The database contains the information (names, addresses, account information, and so on) that merges with the boilerplate text to create that oxymoronic marvel of the computer age — the personalized form letter.

Merging and Mac Word Processors

The Mac world's most popular word processors have mail merge features that go beyond simple form letters. Microsoft Word 5, MacWrite Pro, and WordStar's WriteNow 3 allow conditional merges — if *x* is true, insert text *y*, otherwise insert *z*. If an account is paid up, thank the recipient; otherwise, remind the deadbeat to mail that check. Word, WordPerfect, and WriteNow enable you to type information from the keyboard during the merge. This allows you to add personal comments to some letters. You can also use this capability to prepare other types of documents (such as legal contracts) — store all the boilerplate contract text in one document, and then type specific information during the merge.

Mail merge is one of those word processor features that gets dusty from disuse. True, many people don't need to send personalized form letters. But another reason may be that the merging process isn't as easy as point-and-click. Merging data with canned text means walking the dark alleys of data export and import — transferring information out of a database program and into a word processor. Mail merge also requires some advance set-up time and troubleshooting, lest you get weird results such as *Dear Mr. 123 Main Street.*

In this chapter, I'll show you how to use the mail merge features in Word, WordPerfect, and WriteNow. For a database program, I'll use Claris' popular FileMaker Pro 2. See the Quick Tips box "Merging with an Integrated Program" for an introduction to the mail merge features in two popular integrated programs, ClarisWorks and Microsoft Works. Their mail merge features aren't as sophisticated as those of the word processors, but they're easier to use because you don't have to move data from one program to another.

QUICK TIPS

Merging with an Integrated Program

If you don't need conditional merges or the ability to supply information from the keyboard during a merge, consider using an integrated program for mail merge. ClarisWorks and Microsoft Works both have straightforward, approachable mail merge features that don't force you to grapple with text-only files, export and import, delimiters, and arcane field codes.

With either program, create the database document as you normally would. Next, create a word processor document containing the template text — the text that will be merged with the database. Before continuing, be sure the database document is open.

Using Microsoft Works

To insert a field at a given spot in a template, choose Merge Fields from the Document menu and select the desired database and field. Use the Print Preview command to preview the form letters. To print the letters, choose Print and be sure the Print Merge Fields option is checked.

Using ClarisWorks

To insert a field in the template, choose Mail Merge from the File menu. Select the database and click OK; then select the desired field. To print the letters, click the Print Merge button in the Mail Merge dialog box.

Preparing to Merge

A mail merge project generally requires the following three components (see Figure 8-1 "Mail Merge Illustrated" on the next page):

- A database containing the information you want to insert arranged in typical database fashion — a collection of fields (name, address, city, state, zip code, and so on) and records (all the fields for one entry — for example, one person's name and address information)
- A word processor document (Word and WriteNow call it the *data document* and WordPerfect calls it the *secondary file* or the *address file*)
- A word processor document containing the boilerplate text (Word calls it the main document, WriteNow the template document, and WordPerfect the primary file), including field-name codes that show where the information from the data document goes

After you assemble these three pieces, you tell your word processor to begin merging. The word processor then creates a new, untitled document — the *merge document* — containing the boilerplate text as well as the data from each record of the data document, with page breaks separating each form letter.

There are variations to these basic steps. You can instruct your program to discard the merge document after it's printed, or you can choose to save it. You can work without a data document, typing all your information from the keyboard as each

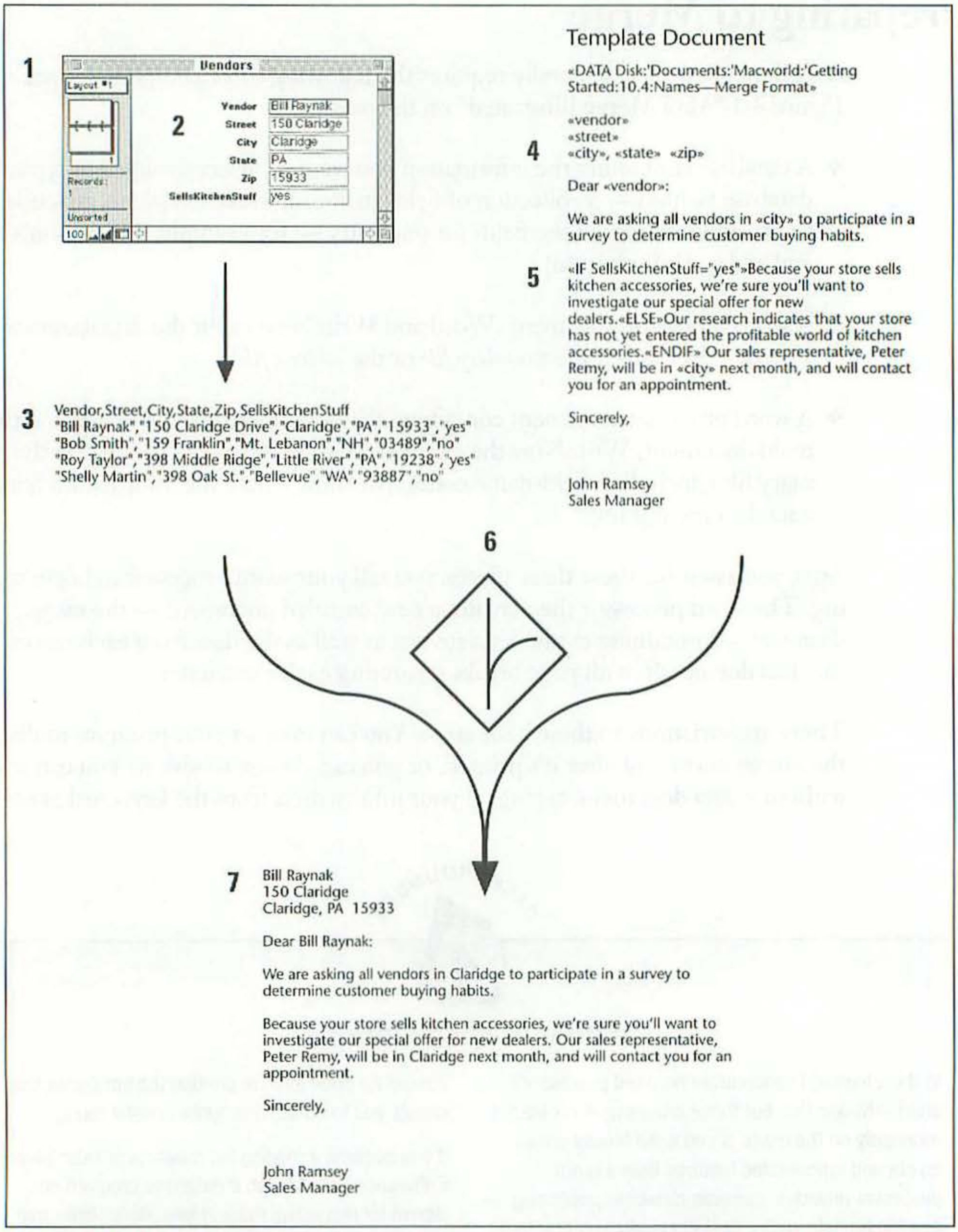
BACKGROUNDER

Other Mailing Options

In this chapter, I concentrate on word processors and FileMaker Pro, but these programs don't have a monopoly on the mails. If you need fancier page-layout and typographic features than a word processor provides, consider *database publishing* — combining data with a desktop publishing program. The basic concepts are similar, except you use a publishing program and a third-party utility to create the template documents.

For Aldus PageMaker, the best database publishing tool is Elseware's DataShaper. For QuarkXPress, it's Em Software's xdata. Both programs also include a special zip code font for printing the bar codes that enable you to obtain discounted postal rates.

If you become a mailing list maven, consider Satori Software's Bulk Mailer, a database program designed for managing mailing lists. Bulk Mailer can identify and remove duplicate entries, calculate mailing costs, sort according to carrier routes, and print labels with or without postal bar codes. Bulk Mailer can also export a database as a merge-format or tab-delimited text file. The program's manual includes a helpful primer on postal rates and delivery options.



Vendor Bill Raynak
Street 150 Claridge
City Claridge
State PA
Zip 15933
SellsKitchenStuff yes

```
Vendor,Street,City,State,Zip,SellsKitchenStuff
"Bill Raynak","150 Claridge Drive","Claridge","PA","15933","yes"
"Bob Smith","159 Franklin","Mt. Lebanon","NH","03489","no"
"Roy Taylor","398 Middle Ridge","Little River","PA","19238","yes"
"Shelly Martin","398 Oak St.","Bellevue","WA","93887","no"
```

Template Document

«DATA Disk:'Documents:'Macworld:'Getting Started:10.4:Names—Merge Format»

«vendor»
«street»
«city», «state» «zip»

Dear «vendor»:

We are asking all vendors in «city» to participate in a survey to determine customer buying habits.

«IF SellsKitchenStuff="yes"»Because your store sells kitchen accessories, we're sure you'll want to investigate our special offer for new dealers.«ELSE»Our research indicates that your store has not yet entered the profitable world of kitchen accessories.«ENDIF» Our sales representative, Peter Remy, will be in «city» next month, and will contact you for an appointment.

Sincerely,

John Ramsey
Sales Manager

Bill Raynak
150 Claridge
Claridge, PA 15933

Dear Bill Raynak:

We are asking all vendors in Claridge to participate in a survey to determine customer buying habits.

Because your store sells kitchen accessories, we're sure you'll want to investigate our special offer for new dealers. Our sales representative, Peter Remy, will be in Claridge next month, and will contact you for an appointment.

Sincerely,

John Ramsey
Sales Manager

Figure 8-1: Mail Merge Illustrated Mail merge begins with a database (1), with its fields and records (2). You prepare a data document by exporting the database as a text-only file (3). This example is a comma-delimited file — each field is separated by commas, and each field item is enclosed within quotes. The first line of the data document is a header record that identifies the field names. The form letter's contents are determined by the template document, which uses field codes (4) to tell the word processor where to insert information from the data document. Word and WriteNow allow conditional merges (5) that insert text only if a certain field contains a specified value. The data and template documents meet during the merge itself (6). The result is a personalized form letter (7).

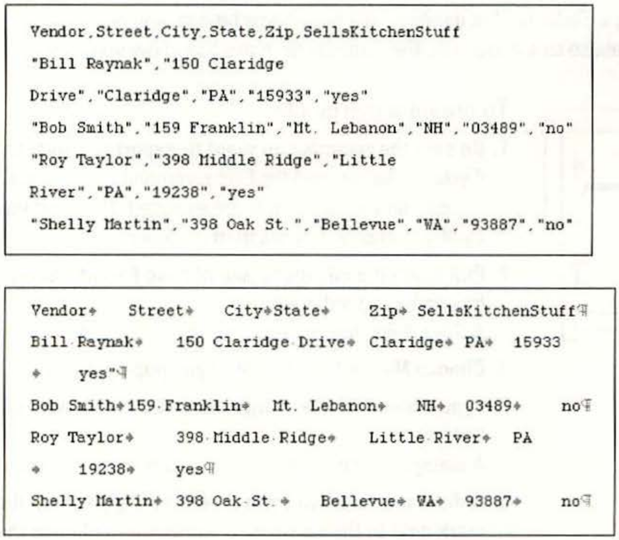
new letter appears. You can also create the data document within your word processor; Word's table feature comes in handy for this. In WordPerfect, you can run a macro (an autopilot-like series of commands) during the merge. I'll show you some of these merge variations shortly.

Exporting the Database

Before you start up a word processor, you need to export your database, creating a text-only file that you then import into the word processor to create the data document. This export-import routine is one of mail merge's tallest hurdles — it's the reason many people resort to the *Dear valued customer* approach.

Exporting and importing is necessary because a word processor can't directly read a database program's files — they're different types of tools. You can't use a word processor to open a FileMaker Pro database any more than you can use a can opener to open a bottle of wine.

For your word processor to distinguish one field from another and one record from the next, fields and records must be separated by special characters called delimiters. The most common delimiting scheme involves separating each field by a tab character and each record by a carriage return (see Figure 8-2 "Separating Fields and Records"). A file organized this way is often called a *tab-delimited* text file.



```
Vendor,Street,City,State,Zip,SellsKitchenStuff
"Bill Raynak","150 Claridge
Drive","Claridge","PA","15933","yes"
"Bob Smith","159 Franklin","Mt. Lebanon","NH","03489","no"
"Roy Taylor","398 Middle Ridge","Little
River","PA","19238","yes"
"Shelly Martin","398 Oak St.","Bellevue","WA","93887","no"
```

```
Vendor→   Street→   City→State→   Zip→ SellsKitchenStuff¶
Bill·Raynak→   150 Claridge·Drive→ Claridge→ PA→  15933
→   yes"¶
Bob Smith→159·Franklin→  Mt. Lebanon→   NH→  03489→    no¶
Roy Taylor→    398·Middle·Ridge→   Little·River→  PA
→   19238→   yes¶
Shelly·Martin→ 398 Oak·St.→   Bellevue→ WA→  93887→    no¶
```

Figure 8-2: Separating Fields and Records A comma delimited text file (top) separates each field with a comma and each record with a carriage return. The quotes enclosing each field item allow fields themselves to contain commas (for example, "Smith, John"). A tab-delimited text file (bottom) separates fields with tab codes, visible here as right-pointing arrows. The first line of each file is a header record that defines names for each field.

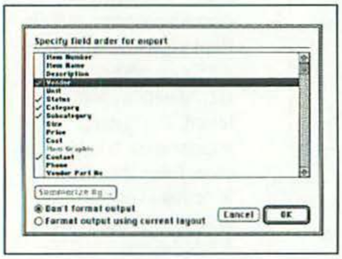
Another scheme involves separating fields with commas instead of tabs, with each field item enclosed within "quotes" — the *comma-delimited* format. Microsoft Word and WriteNow can work with either format. WordPerfect requires data documents to be in a special format. See the section "Merging with WordPerfect," later in this chapter.

There's another important piece of information a word processor needs before it can accomplish a successful merge — a line at the top of the data file, often called a header record, that contains the name of each data field being used (see Figure 8-2 "Separating Fields and Records" on the previous page).

If you're using FileMaker Pro to create a data file, simply save the data file in FileMaker Pro's *merge format.* Specifically designed for mail-merge applications, the merge format is identical to the comma-delimited format, with one exception — it automatically inserts a header record into the data file. If you use a database or spreadsheet program that can create only standard comma- or tab-delimited text files rather than merge-format files, you need to type the header record yourself after you import the data file into your word processor.

Creating a FileMaker Pro Merge File

Before using a FileMaker Pro database in a mail merge project, you need to export the database as a merge file. The instructions in this box show you how.



To create a merge file:

1. **Be sure the records you want to export are selected.**
   If you previously used the Find command to select only certain records, only those records are exported. To export the entire database, choose Find All from the Select menu.
2. **Pull down the File menu and choose Export Records from the Import/Export submenu.**
   A Save dialog box appears.
3. **Choose Merge from the File Type pop-up menu.**
4. **Type a name for the merge file and click New or press Return.**
   A dialog box appears that lets you choose which fields to export.
5. **If there are fields you don't want to export, click the check mark next to their names. If you want to change the order in which fields are exported, rearrange the fields by dragging them.**
6. **Click OK when you've finished.**
   FileMaker Pro exports the database.

Merging with Microsoft Word

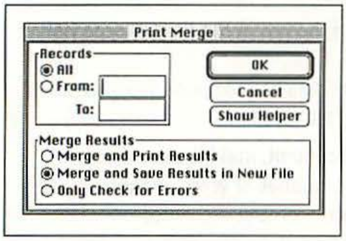
The merge file is your data document — it contains the information that is inserted in each form letter. Your next job is to prepare the template document — the one that tells your word processor where and how to insert information from the data document. You won't be using the database program from this point on, so you can quit it and start your word processor.

Word 5 provides a *print merge helper* that walks you through the process of choosing a data document and creating the template document. Details on using the print merge helper appear in the Step-by-Step box "Word Mail Merge Techniques."

All merge-related commands that appear in a Word template document must be surrounded by the international quotation mark characters « and ». Word's Print Merge Helper bar inserts these characters automatically as you choose field names and other merge statements (see Figure 8-3 "Merging with Word"). You can also type the characters by hand: Press Option-\ for « and Shift-Option-\ for ».

Word Mail Merge Techniques

The instructions in this box show how to perform a mail merge in Word.



Records
● All
○ From:
To:

Merge Results
○ Merge and Print Results
● Merge and Save Results in New File
○ Only Check for Errors

To begin a new template document:

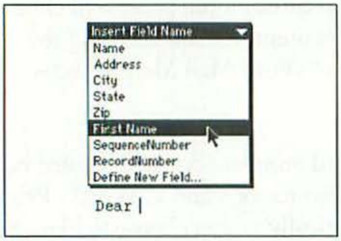
1. **Choose New from the File menu.**
2. **Choose Print Merge from the File menu.**
   The Print Merge dialog box appears.
3. **Select the Merge and Save Results in New File option.**
   If you want to send the form letters directly to the printer without saving them, choose the Merge and Print Results option instead.
4. **Click the Show Helper button.**
   A dialog box appears asking you to select the data document.
5. **Locate the merge file you created previously and double-click its name.**
   If a dialog box appears asking you to select the Text or Text With Layout format, choose Text. In a moment, the Print Merge Helper bar appears, with a special instruction line below it. This line, the *data statement,* tells Word which file to use for the data document.

(continued on the next page)

(continued from the previous page)

6. Type and format the boilerplate text as you normally would.
Add fields and keywords as described in the following steps.

7. When you've finished the template, save it.
You may want to include the word *template* in its name to remind you of the document's purpose.

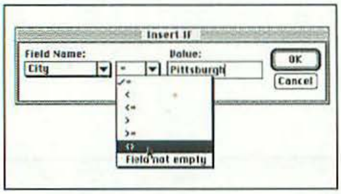


Dear

To insert the contents of a field in a template:

1. Position the blinking insertion point where you want the field's contents to appear.

2. Choose the field's name from the Insert Field Name pop-up menu.

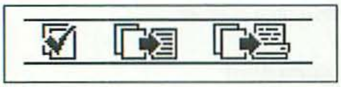


Field Name: City
=
Value: Pittsburgh

To insert a keyword in a template:

1. Choose the keyword from the Insert Keyword pop-up menu.
A dialog box appears asking for additional information. For example, if you're inserting an IF...ENDIF series of keywords, the dialog box lets you specify which field you want to test, the type of test you want to perform, and the value you want to compare against.

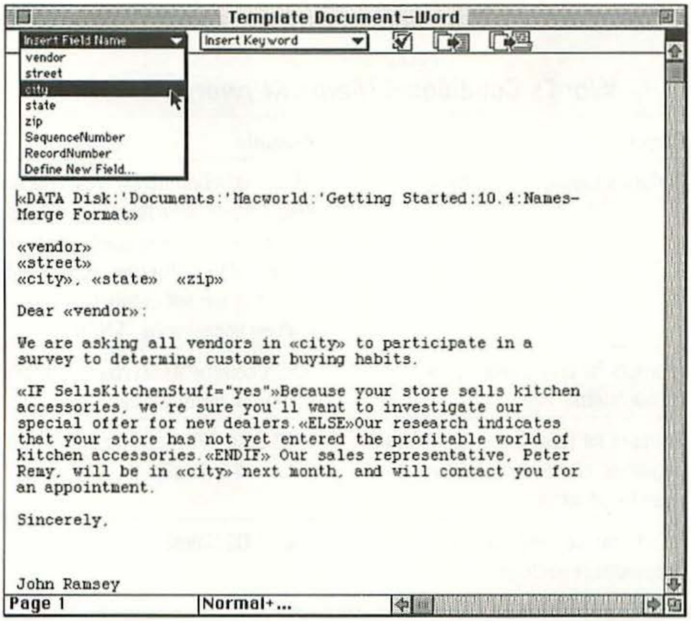
2. Click OK or press Return.



To perform the merge and create a new document containing the form letters:

1. Click the second icon from the left in the Print Merge Helper bar.
This tells Word to merge the data and template documents and create a new file containing the results.

2. Proofread the resulting document, making sure that each piece of data has the right number of word spaces around it.
It's easy to wind up with incorrect spacing, especially when you're inserting one field immediately after another or using the IF...ELSE keywords.



«DATA Disk:'Documents:'Macworld:'Getting Started:10.4:Names-Merge Format»

«vendor»
«street»
«city», «state» «zip»

Dear «vendor»:

We are asking all vendors in «city» to participate in a survey to determine customer buying habits.

«IF SellsKitchenStuff="yes"»Because your store sells kitchen accessories, we're sure you'll want to investigate our special offer for new dealers.«ELSE»Our research indicates that your store has not yet entered the profitable world of kitchen accessories.«ENDIF» Our sales representative, Peter Remy, will be in «city» next month, and will contact you for an appointment.

Sincerely,

John Ramsey

Figure 8-3: Merging with Word The pop-up menus in Word's Print Merge Helper bar simplify adding field names and keywords to a template document. The first line of this template document is the DATA statement, which tells Word where to find the data document for this merge project.

Creating the Template Document

Now you're ready to create the text of the form letter. Type and format the boilerplate text as you normally would. When you want to insert the contents of a certain field, choose its name from the Insert Field Name pop-up menu. Some lines — such as the recipient's address in a business letter — may contain only field names. If you want a field's contents to appear in a different font, size, or style, select (highlight) the field name and then specify the format.

Next to the Insert Field Name pop-up menu on the Print Merge Helper bar is the Insert Keyword pop-up menu. This menu lets you insert keywords that tap Word's specialized print-merge features. For example, the IF...ELSE...ENDIF series of keywords lets you create those conditional merges I mentioned earlier. The ASK keyword displays a dialog box that lets you type some information during the merge (see Table 8-1).

Table 8-1
Word's Conditional-Merge Keywords

Keyword(s)	*Purpose*	*Example*
IF...ELSE...ENDIF	Performs conditional merging	«IF SellsKitchenStuff="yes"»Because your store sells kitchen accessories, we're sure you'll want to investigate our special offer for new dealers.«ELSE»Our research indicates that your store has not yet entered the profitable world of kitchen accessories.«ENDIF»
ASK	Prompts for typed information for each letter	«ASK comment=?Type an optional comment for this letter:»
SET	Prompts for typed information at the beginning of the merge; information is used for all letters	«SET date=?What date would you like to put on all letters?»
INCLUDE	Inserts the contents of a different document in each letter	«INCLUDE SalesPromotionInfo»

After you generate the form letters, notice that each one is separated by a section break, which appears as a double-dotted line when you're viewing the document in normal view. This causes each letter to begin on a new page. You can see this by switching to page layout view.

If the form letters look correct, you can print them. You can save the merge document if you anticipate having to print the letters again. You can always generate the merge document again if you save the data and template documents.

Merging with WriteNow

The basic steps behind merging with WriteNow are very similar. WriteNow uses the same merge characters (« and ») and keywords as Word; you can generally move template and data documents between Word and WriteNow and use them without modification.

There is one big difference: WriteNow doesn't provide a Print Merge Helper, so you must cook up field names and keywords yourself. Use the examples in Table 8-1 as a guide, and see the WriteNow manual for more details.

Print Merge + Fax Modem = Fax Merge

If your Mac has a fax modem (described in Chapter 17), you can use mail merge to churn out personalized faxes. All the information in this chapter applies; simply use the Chooser desk accessory to select your fax modem driver before using the Print command.

To avoid errors and wasted phone calls, it's a good idea to proofread each personalized fax before you send it.

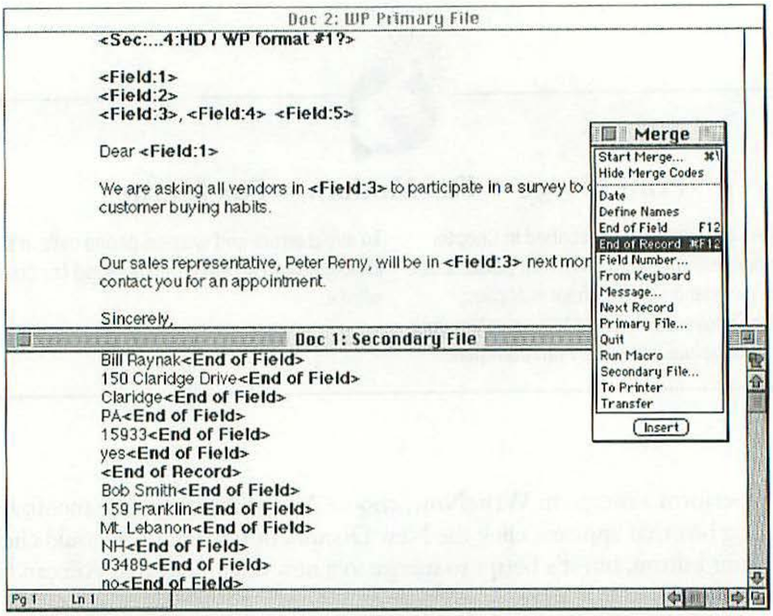
To perform a merge in WriteNow, choose Merge from the File menu. In the dialog box that appears, click the New Document button. (You could click the Printer button, but it's better to merge to a new document that you can proofread for errors.)

After you click New Document (or Printer, if you're feeling confident), a dialog box appears asking if the data document has line breaks inserted. Click No, and the merge takes place. Like Word, WriteNow formats the merge document so that each form letter begins on a new page.

Merging with WordPerfect

A WordPerfect template document, called a primary file, looks much like a Word or WriteNow template document, with field codes indicating where information from the database is inserted. The field codes themselves are a bit different; field names, for example, are enclosed in greater-than and less-than signs, not the « and » characters (see Figure 8-4 "WordPerfect Merging"). Also, WordPerfect simply numbers fields instead of requiring you to give them descriptive names.

Where the data document is concerned, WordPerfect breaks from the pack. WordPerfect can't use any of the standard text-only formats I described earlier — tab-delimited, comma-delimited, or merge. Instead, you need to manually indicate where fields and records end by inserting *end of field* and *end of record* codes. This adds extra work to the merging process.



<Sec:...4:HD / WP format #1?>

<Field:1>
<Field:2>
<Field:3>, **<Field:4>** **<Field:5>**

Dear **<Field:1>**

We are asking all vendors in **<Field:3>** to participate in a survey to
customer buying habits.

Our sales representative, Peter Remy, will be in **<Field:3>** next mor
contact you for an appointment.

Sincerely,

Bill Raynak**<End of Field>**
150 Claridge Drive**<End of Field>**
Claridge**<End of Field>**
PA**<End of Field>**
15933**<End of Field>**
yes**<End of Field>**
<End of Record>
Bob Smith**<End of Field>**
159 Franklin**<End of Field>**
Mt. Lebanon**<End of Field>**
NH**<End of Field>**
03489**<End of Field>**
no**<End of Field>**

Figure 8-4: WordPerfect Merging WordPerfect's Merge dialog box lets you insert field numbers and the end-of-field and end-of-record codes shown in the lower window.

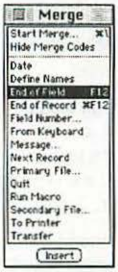
Fortunately, you can use the Find/Change command to automate some of the work. Here's how: When exporting your database, create a tab-delimited text file. Open this file in WordPerfect and use Find/Change to change each carriage return code to a carriage return followed by an end of record code and a carriage return. (The carriage return is called a hard return in the Find/Change dialog box's Insert menu.) Next, use Find/Change to change each tab code to an end of field code followed by a carriage return. If you like, you can give descriptive names to each field; see the Merge section of the WordPerfect user guide for details. Save the resulting file as a WordPerfect document, and then close it.

For details on creating a template document and performing a merge, see the Step-by-Step box "WordPerfect Mail Merge Techniques."

QUICK TIPS

WordPerfect Mail Merge Techniques

The instructions in this box show how to perform a mail merge in WordPerfect.

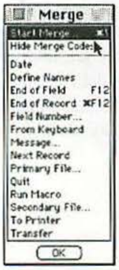


To begin a new primary file (the template document):

1. **Choose New from the File menu.**
2. **Choose Merge from the Tools menu.**

   The Merge dialog box appears.
3. **To insert a field code, double-click the Field Number option in the Merge box, and then specify a number for the field in the Field Number dialog box.**

   If you want to be prompted for a field name or number during the merge, choose the Prompt for Field Number During Merge option.
4. **Save and close the primary file when you've finished.**



To perform the merge:

1. **Choose New from the File menu.**
2. **Choose Merge from the Tools menu.**
3. **Double-click the Start Merge option.**

   A dialog box appears asking you to select the primary file.
4. **Select the primary file.**

   A dialog box appears asking you to select the secondary file.
5. **Select the secondary file.**

   WordPerfect performs the merge, inserting a page break between each form letter.

Sincerely Yours...

In the past, sending mass mailings meant contracting with a mailing house and paying dearly for the privilege. With mail merge, small businesses can employ the same direct mail sales techniques big businesses have used for years. You, dear valued reader, can produce customized form letters.

CHAPTER 8 CONCEPTS AND TERMS

- A word processor's mail merge features enable you to combine a database with boilerplate text to produce personalized form letters and other documents.
- A mail merge project generally requires two files — a merge file (created with your database program's export features) and a template document (created with your word processor).
- In addition to field names that show where to insert each piece of information, template documents may contain keywords such as IF...ENDIF, which enable the word processor to insert information only when certain conditions are met.
- If your mail merge needs are simple, you may want to use an integrated program such as ClarisWorks or Microsoft Works to avoid the time and trouble of exporting and importing a database.

comma-delimited text file
A file in which fields are separated by commas, with each field's data enclosed within "quotes."

conditional merge
A merging option in which the text inserted by the word processor depends on the presence of certain values in the database.

data document
In Word and WriteNow, a word processor document into which you import the information from the database. Called the *secondary file* or the *address file* in WordPerfect.

delimiter
In an exported database file, a special character (usually a tab code, sometimes a comma) that separates one field from the next.

end-of-field code
In WordPerfect, a code that indicates where fields end.

end-of-record code
In WordPerfect, a code that indicates where records end.

header record
A line at the top of an exported database file that contains the name of each data field being used.

keywords
Special command words such as IF...THEN that you insert in a template document to control the merging process.

merge format
A FileMaker Pro export file format specifically designed for mail-merge applications. A merge-format file is comma-delimited and begins with a header record.

print merge helper
In Word 5, a feature that walks you through the process of choosing a data document and creating the template document.

tab-delimited text file
A file in which each field is separated by a tab character and each record by a carriage return.

template document
A word processor document containing the boilerplate text, including field-name codes that show where the information from the data document goes. It is called the *main document* in Word and the *primary file* in WordPerfect.

CHAPTER NINE

Desktop Publishing Basics

IN THIS CHAPTER

- Learning basic paste-up and layout techniques
- Replacing traditional publishing methods with electronic publishing
- Balancing the costs and features of electronic publishing systems
- Shopping for the publishing software that meets your needs
- Comparing the advantages of PageMaker and QuarkXPress

In the last thirty years, the graphic arts industry has seen more revolutions than any third-world country. In the sixties, the turn-of-the-century Linotype and Monotype hot-metal typesetters based on medieval printing technologies rapidly began to be displaced by phototypesetting machines whose speed and output improved in quantum leaps — each machine becoming obsolete within a few years of its introduction. The seventies saw large publishing houses, printers, and newspapers begin to use on-screen page-makeup systems that enabled graphic artists to lay out pages electronically — without T squares, X-acto knives, and the other tools of mechanical pasteup.

Although electronics played a prominent role in the evolution of phototypesetting and electronic page-makeup equipment, personal computers didn't. They lacked the processing power to calculate precise character widths and line endings, and the graphics to display various fonts and sizes. Then the Macintosh appeared. Armed with electronic publishing programs, the Mac has picked off the expensive page-layout systems, sniped at typesetters, and forced established type houses either to join the revolution or retreat.

As a computer user, I'm excited to see that technology has advanced enough to enable nonprofessionals to set type and paste up pages with a $1,000 Macintosh. But as a former typographer, I cringe when that technology is misused. Properly producing a printed piece takes time, patience, and at least a rudimentary knowledge of design and typographic concepts. In this chapter, I'll show you the basics behind electronic publishing — and the responsibilities you assume when you start producing your own publications. In the next chapter, I show you how to accomplish common publishing tasks using PageMaker and QuarkXPress, the two most popular Mac publishing programs.

ON THE CD

- Aldus PageMaker 5 demo
- Aldus Personal Press
- FrameMaker

The Desktop Difference

In the world of electronic page makeup, a video screen and a mouse replace the traditional layout table and its tools (see the Background box "Layout and Pasteup the Old-Fashioned Way"). Rules, halftone windows, and crop marks are added with electronic drawing tools; then the whole shebang is sent to a phototypesetting machine — an *imagesetter* — that delivers a camera-ready page.

If you're willing to invest some time and effort in learning a sophisticated word processor or an electronic publishing program and some fundamentals of publishing design, you can do what used to require several specialists and expensive typesetting equipment. Using the Mac, you can write and proofread copy, design a layout, and create camera-ready pages on a laser printer or an imagesetter. If you don't own a laser printer (or an imagesetter), you can use one at any of the growing number of copy shops and computer stores that rent time on electronic publishing systems.

With commercial typesetting and graphic arts firms charging $20 an hour and up (way up), it doesn't take long for an electronic publishing system to pay for itself. And there's the convenience factor. You can experiment with different designs or make last-minute type corrections in the time it it takes to call a typesetting service and place an order. Best of all, the Mac can serve you in other areas when you aren't wearing your printer's apron.

Toll Road Ahead

You have to spend before you can save. The road to electronic publishing has a number of alternate routes, and each takes a progressively higher toll on your bank account. The least expensive involves combining the Mac's typographic prowess with conventional pasteup methods. By preparing text with a word processor, printing it on a laser printer, and then pasting it up by hand, you can dramatically reduce your typesetting and production costs, which are often the most expensive part of a job.

If you're willing to rent time on a laser printer, the only vehicle needed to travel this path is a Mac with a word processor. A rusty 128K Mac and the original version of MacWrite will do, but I'd suggest at least a Mac Classic with a hard drive and a more powerful word processor, such as Microsoft Word (I have more to say about software shopping shortly).

A more direct route, the one most people take, involves using a publishing program to paste up pages electronically. Most publishing programs mimic conventional pasteup methods. After you specify basic information about your publication — its page size, number of pages, and whether the final product will be printed on both

BACKGROUNDER

Layout and Pasteup the Old-Fashioned Way

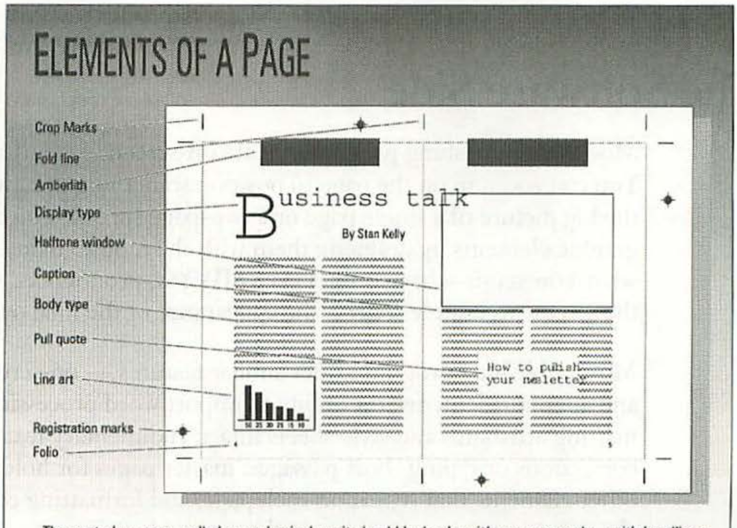
Before you can fully appreciate how the Mac streamlines the publishing process, it helps to know how printed materials are produced without it (see the figure below). Initially, a graphic designer develops a concept by drawing rough, or thumbnail, sketches. Later, comprehensive drawings, called comps, are produced, which show how the final piece will look.

Next, the designer chooses the typefaces and type sizes for the text, using a tedious process called *copyfitting* to make sure it will fit the available space. From there, the text is marked up with specifications for line lengths, fonts (a typeface in a particular size), and spacing. The typesetter may key in the text from the marked-up copy or convert the author's disk files, adding the necessary typesetting codes.

The layout artist then creates a *dummy,* a preliminary layout that shows how and where the text and graphics will go on each page. The artist refers to the dummy when pasting up the finished type on cardboard sheets, using T squares, triangles, and sharp eyes to make sure everything's straight. If the design calls for them, the artist will draw lines (called rules) with a drafting pen, or add stick-on rule tape (clear adhesive tape on which rules have been machine drawn).

If the page includes photographs, a screened negative called a *halftone* must be made from each photo to convert its various shades into dots that can be printed. The artist cuts a matching window from opaque film (such as Para-paque or Zipatone) and pastes it down on the board to show the printer where to position the halftone. Line art — graphs or line drawings — does not require halftones.

The artist then draws crop marks to denote the page's boundaries and may attach a protective sheet of tissue paper on which to mark ink colors or paper stock. Finally, when the cardboard sheet (called a *mechanical*) is camera ready, the printer shoots an actual-size negative from which the printing plate is made.



The pasted-up page, called a mechanical, as it should look when it's camera ready—with headlines and body text aligned, line art and halftone keyline in place, and crop marks, registration marks, and fold lines to guide the printer.

sides — the program presents you with a blank page into which you can import word processing documents and graphics created with drawing or business graphics programs. The toll: a Mac with a hard drive and at least 4MB of memory (preferably 5MB or more), and for satisfying performance, the Mac itself should be at least a 68030-based machine such as a Classic II, Color Classic, or LC III.

The third route to electronic publishing traverses the same terrain as the second but includes some high-priced stopovers to pick up a large-screen display and a scanner. Large-screen displays are just that — big screens that let you view an entire 8½ by 11-inch page — or even two pages, side-by-side, without having to scroll (see Chapter 31).

Scanners are add-ons that use optical sensors to convert photographs or other artwork into graphic documents where the original image is represented by a series of dots (see Chapter 14). Scanners range in price from a few hundred dollars for hand-held scanners such as Thunderware's LightningScan series to around $1,000 for scanners such as Apple's Color OneScanner and Hewlett-Packard's ScanJet series, which can produce images that look at least as good as a high-quality newspaper photo.

Scanners can earn their keep in another way: When driven by the appropriate software, they become optical character recognition (OCR) devices, able to "read" typed or typeset pages of text and create disk files you can edit and reformat with a word processor (see Chapter 19).

The Software Side

Most Mac publishing programs create on-screen versions of an artist's layout table. You can zoom in on the page to position something precisely, or zoom out to get the big picture of a single page or a two-page spread. You can position text and graphic elements by dragging them with the mouse. In keeping with the Mac's what-you-see-is-what-you-get (WYSIWYG, pronounced wizzy-wig) philosophy, the screen accurately reflects the appearance of the final page.

Most publishing programs offer similar features — on-screen rulers for measuring and aligning elements; the ability to import word processing documents with formatting attributes and style sheets intact; rudimentary text editing for making corrections or typing short passages; master pages for holding page numbers and other elements that repeat on each page; and formatting commands that let you change the appearance of text and create tables.

Most programs also let you type position values into a dialog box — handy for precise positioning. (For more comparisons between PageMaker and QuarkXPress, see the Background box "PageMaker Versus QuarkXPress.")

PageMaker Versus QuarkXPress

If you plan on buying a mainstream publishing program, your decision will probably boil down to two programs: Quark's QuarkXPress or Aldus PageMaker. QuarkXPress has become extremely popular among graphics professionals in the past few years. It's a great program, but so is my favorite — PageMaker.

Why do I prefer PageMaker? For one thing, I like its way of operating. QuarkXPress' draw-a-frame-and-then-import routine gets in my way. But more important, I believe — as do some of the industry's top electronic publishing experts — that PageMaker's typographic features are superior to QuarkXPress'. That's important, because a publishing program is, first and foremost, a typesetting program.

Here are some details to support my choice:

- PageMaker provides five tracking levels versus QuarkXPress' one, giving you better command of intercharacter spacing.
- As for manual kerning, PageMaker theoretically offers less precision than QuarkXPress, but the differences will only show up in very large type sizes printed on high-resolution imagesetters.
- QuarkXPress doesn't let you disable automatic kerning for individual paragraphs; PageMaker does, and lets you control it through style sheets. That's ideal when you want to automatically kern text in some fonts or elements but not others.
- PageMaker's ranked hyphenation scheme allows for better, more-accurate automatic hyphenation.
- Although QuarkXPress' frame approach lends itself to structured documents, PageMaker remains the better program for producing books and manuals, thanks in part to its ability to link separate documents and generate a table of contents and index that spans all of the linked documents. (Indeed, PageMaker's indexing features are among the best you'll find anywhere.)
- PageMaker's unique word processor-like story editor lets you edit without having to weave through a publication's pages.
- PageMaker also provides a better system of managing the links between the publication file and the text and graphics files you imported into it. That simplifies updating publications when their source files change and makes it easier to send publications to imagesetting service bureaus.
- PageMaker's printing features, manual, and online help are better. And PageMaker has historically been more reliable than QuarkXPress, thanks in part to its mini-save feature, which automatically saves the page you're working on when you switch to another page. Aldus' technical support is also better.
- PageMaker 5's Control palette provides even more slick positioning aids than QuarkXPress' measurements palette. In fact, with version 5, PageMaker now has most of the layout goodies — text and graphics rotation, built-in color separation, and editable kerning and tracking data — that have helped make QuarkXPress so popular.

QuarkXPress does have the edge over PageMaker in several areas. As I describe in the next chapter, far more software add-ons have been developed for QuarkXPress. Also, its frame-oriented approach has made it very popular for periodical publishing. QuarkXPress is generally faster than PageMaker, too, although with version 5, Aldus has improved PageMaker's performance over earlier versions.

In the end, both programs are among the best you'll find anywhere, and it's possible to produce top-notch publications in either one. Many publishing professionals buy both programs and apply each one's strengths to the appropriate jobs. But if you can buy only one program, my pick is PageMaker.

Two different layout philosophies

It's important to assess how the programs you're considering approach the challenges of electronic publishing. The most basic point of comparison concerns the way you position text and graphics on the page. Two schemes predominate — the on-the-fly, import-and-place scheme exemplified by Aldus PageMaker, and the draw-a-frame-and-then-import approach of QuarkXPress and most other programs.

To bring a text or graphics document into PageMaker, you simply choose the Place command and choose the document. The mouse pointer changes shape to indicate that it's "loaded" with text or a graphic. Click within the layout, and the item is placed on the page (see Figure 9-1 "Making Pages with PageMaker").

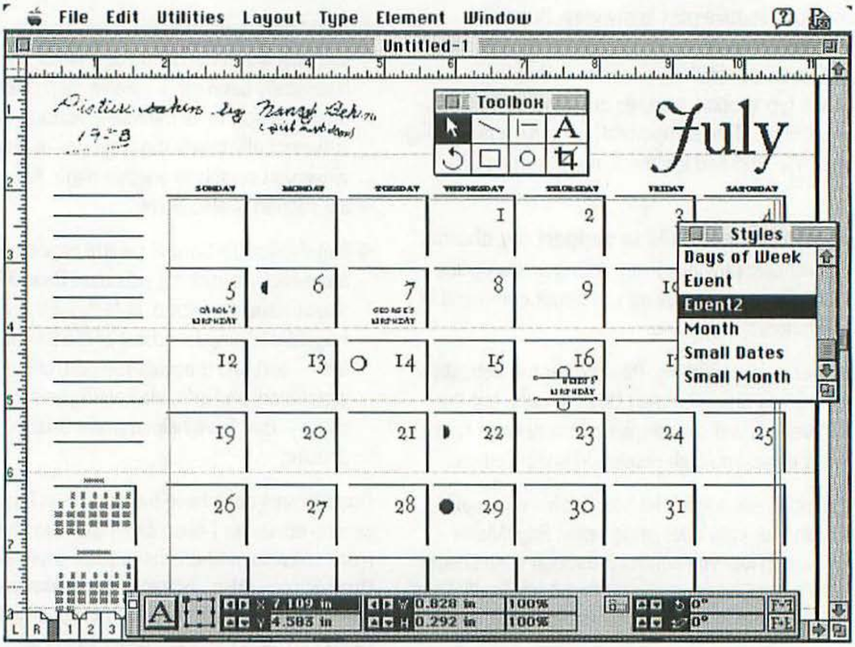


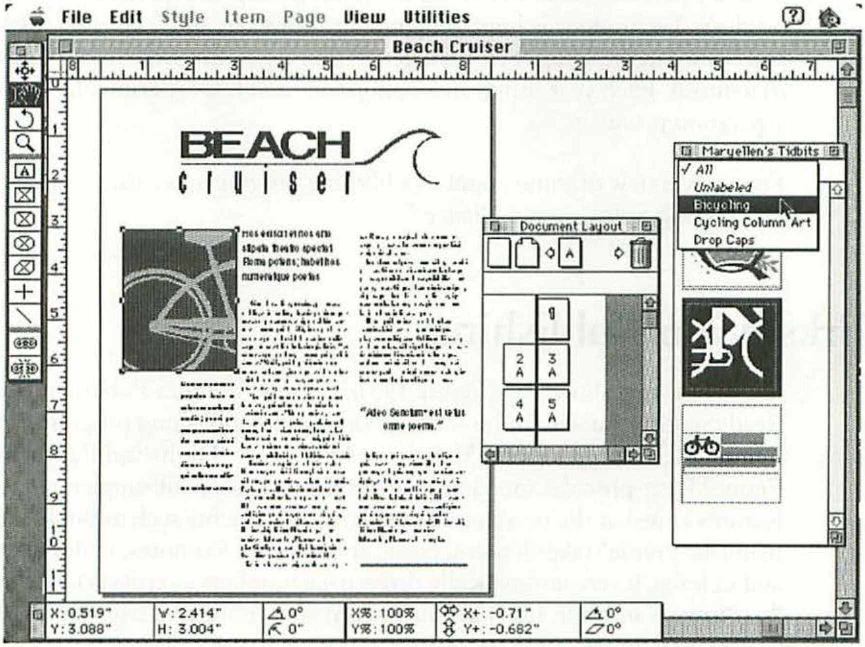
Figure 9-1: Making Pages with PageMaker Publishing programs such as Aldus PageMaker provide on-screen layout tables upon which you electronically attach text and graphics. You can also use these tables to temporarily hold text or graphic items much like a paste-up artist might tack a strip of text to the edge of a layout table. The dotted ruler guides aid in positioning and aligning elements, while the Styles palette lets you assign style sheets to text. The icons in the lower-left corner enable you to access other pages in the publication. The icons labeled L and R correspond to left and right master pages, which hold page numbers and other elements that appear on each page. Also note the drawing tools for creating boxes, lines (also called rules), and other shapes.

With QuarkXPress and most other programs, before you can bring in a text or graphic, you must draw a box on the layout to indicate where you want the item to appear. Then you select the box and choose a Get Text or Get Picture command (see Figure 9-2 "Layout Librarian").

Many people find the PageMaker approach preferable for experimenting with layouts — it's also more akin to the way a layout artist works. The frame-oriented scheme lends itself to periodicals, books, and manuals, where consistency and advance planning are paramount.

Color on the leading edge

Besides being able to import images from graphics programs, publishing programs provide tools for drawing rules, boxes, and circles. They also let you create *spot color* — a single color dropped into certain page elements (such as a headline or a



X: 0.519"
Y: 3.088"
W: 2.414"
H: 3.004"
0°
0"
X%: 100%
Y%: 100%
X+: -0.71"
Y+: -0.682"
0°
0°

Figure 9-2: Layout Librarian QuarkXPress' innovative library feature lets you store and recall often-used text or graphics. Retrieving an element from the library is a simple matter of dragging it from the library window (here, called *Maryellen's Tidbits*) onto the page. (PageMaker 5 has a similar library feature that also works with the Aldus Fetch image database software.) Also visible here is QuarkXPress' Document Layout palette, which lets you rearrange and quickly access a publication's pages. The measurements palette at bottom displays information about the selected element and lets you conveniently modify its position, text, and other attributes.

horizontal bar) used to grab readers' attention. When you print a publication containing spot color, the program prints a separate sheet of paper for each color. Each sheet contains registration marks that a printing company uses to align colors.

Aldus PageMaker, QuarkXPress, and Manhattan Graphics' ReadySetGo can also import color images, and can print *color separations* that a professional printer uses to create the four printing plates (cyan, yellow, magenta, and black) used to print color images on offset printing presses. This is the leading edge of electronic publishing, and you'll need a sense of adventure and some pioneer spirit to reach it.

Many publishing pros have learned the hard way that it's often easier and more economical to stick with traditional color-separation techniques, which usually involve sending color images to separation houses that use ultra-expensive computer systems from firms such as Crossfield and Scitex. The resulting separations are then stripped into place by hand.

Some publishers strike a middle ground, using a publishing program's color features for proofing, and then using conventional separation techniques for the final product. Technology is improving rapidly, however, and companies like Crossfield and Scitex are building their next-generation separation systems around the Macintosh. Each year brings more affordable and less experimental desktop color separation products.

For an overview of some popular publishing programs, see the Quick Tips box "Publishing Software at a Glance."

Workstation Publishing

A notch or two above PageMaker, QuarkXPress, Ventura Publisher, and ReadySetGo, you will find so-called workstation publishing programs such as Frame Technology's FrameMaker (see Figure 9-3 "High-End Publishing"). FrameMaker provides interactive layout features, too, but supplements them with features aimed at the production of lengthy documents such as books and technical manuals. FrameMaker lets you create and manage footnotes, tables of contents, and indexes. It can automatically revise page numbers in cross references (such as "see 'mouse' on page 150") as you add text to or remove it from a publication.

FrameMaker also provides template features that automate the production of documents where each page has a similar layout. (Ventura Publisher has many of these features, too; indeed, the program's prowess at handling lengthy, structured documents has helped make it one of the IBM PC world's most popular publishing programs. The Macintosh version appeared in late 1990, but never really developed much of a following.)

QUICK TIPS

Publishing Software at a Glance

In this box are the nuts and bolts of the popular publishing programs you have to choose from.

Entry-Level Programs

Aldus Personal Press: Personal Press does what a low-end publishing program should: It streamlines publishing for nonpublishers. You can use its AutoCreate feature to automate production of documents that don't demand finely finessed type. It's also extensible with file import/export modules and scanner drivers.

Timeworks PublishIt Easy: Fast even on the slowest Macs, PublishIt Easy sports a kitchen-sink mix of features that may eliminate having to buy separate drawing and even database programs. Not as smoothly designed as Personal Press, but a capable package.

Mainstream Programs

Aldus PageMaker: The best typography in its class, solid printing and book-making features, extensibility, and an elegant interface combine to make PageMaker the best all-around mainstream package. Version 5 adds many long-overdue features — keyboard positioning and sizing, text and graphics rotation, a library feature for storing often-used elements, and the ability to open more than one document at a time.

Quark QuarkXPress: Another professional-level tool, QuarkXPress has earned praise for its speed and responsiveness. Its frame-oriented approach is ideal for structured publications, and sophisticated software add-ons are available for high-volume production. QuarkXPress' learning curve is steep, but pros will find plenty of power at the summit.

Manhattan Graphics ReadySetGo: Mainstream publishing's also-ran, ReadySetGo is strong on typography and color support, but previous versions' limitations have slowed its acceptance. Version 6 sports a polished interface and many new features. The program has the hooks to allow for powerful software add-ons, but few have been developed.

Long-Document Programs

Frame Technology FrameMaker: Powerful and well designed, FrameMaker is the best choice for scientific and technical publishing. FrameMaker has a fine table editor, allows manual kerning, and can import and print color. But its power demands commitment and a fast machine.

Xerox Ventura Publisher: Ventura's technique of linking publications to their original text and graphics files means the source files are always up to date. The program is a good choice if you already use Ventura on DOS PCs, but Mac veterans will have to adjust to many idiosyncrasies and should consider FrameMaker instead.

All-in-one publishing

Besides handling lengthy documents, workstation publishing programs enable you to produce complex publications without having to use separate word processing and graphics programs. FrameMaker provides powerful drawing features you can use to create technical illustrations and schematics. FrameMaker and Ventura Publisher both provide built-in word processors with advanced features such as revision tracking and equation editing.

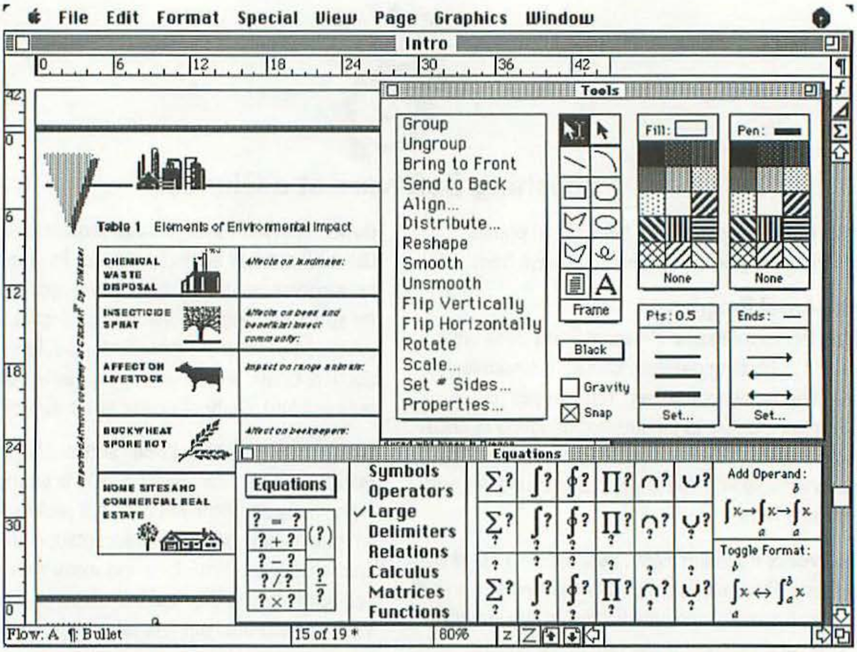


Figure 9-3: High-End Publishing Frame Technology's FrameMaker is a workstation publishing program designed for the production of lengthy documents. FrameMaker provides built-in word processing and drawing features that go far beyond those of general-purpose publishing programs like PageMaker. Note the extensive object-manipulation features in FrameMaker's tool palette (which can be collapsed to show only the most often-used tools). FrameMaker's equation editor is visible at the bottom of the screen.

Workstation publishing programs get their name because they were originally developed for minicomputer-based workstations such as those made by Sun Microsystems and Digital Equipment Corporation. Indeed, FrameMaker is still available for such workstations, and you can transfer publications between the Mac and workstation versions of each product. On the negative side, FrameMaker demands a fast Mac and the program can be difficult to learn. Also, its all-in-one approach makes sense for high-end workstations, where there isn't a huge selection of third-party software, but it's less of an advantage in the Mac world, where you can choose from and combine dozens of powerful word processors and graphics programs.

Scaling the command-driven mountain

On the fringes of the electronic publishing world are *code-oriented* (also known as *command-driven* or *batch-processing*) programs that require typed formatting codes in the text. With code-oriented programs, typed codes such as \hsize = 155mm replace the mouse and menus for positioning and formatting text. This makes them more difficult to use; indeed, you need mountain climbing gear to scale the learning curve of programs like Textures from Blue Sky Research. Textures is based on the TeX (pronounced tek) typesetting language, which was developed in part to streamline the production of lengthy publications containing complex mathematical equations. Another TeX package, OzTeX, is available free through user group libraries and on-line services.

But there are rewards at the summit. Not only can Textures create documents of virtually unlimited size, it can also automatically create footnotes, tables of contents, and indexes. Textures also provides preview windows that show how the final product will appear. The program is best for producing large publications that require a consistent appearance throughout, such as books and training manuals. And because formatting codes are embedded in the original text, a code-oriented program is ideal for publications that need frequent revision.

Publishing Alternatives

With the boundaries increasingly blurred between text processing and publishing, the best electronic publishing program for your needs may actually be a word processor. Microsoft Word, Nisus Software's Nisus, and WordPerfect Corporation's WordPerfect can create footnotes, tables of contents, and indexes. Word also lets you create mathematical equations. WordPerfect, Nisus, and Claris' MacWrite Pro can even wrap text around an irregularly shaped graphic. A word processor may be the best tool for jobs that don't require sophisticated layout features, but that undergo frequent revision.

QUICK TIPS

Essential Reference Books

If you're after professional results, you should take the time to proofread your publication's text carefully to ensure that words are spelled correctly, lines are hyphenated accurately, and punctuation characters are correctly positioned.

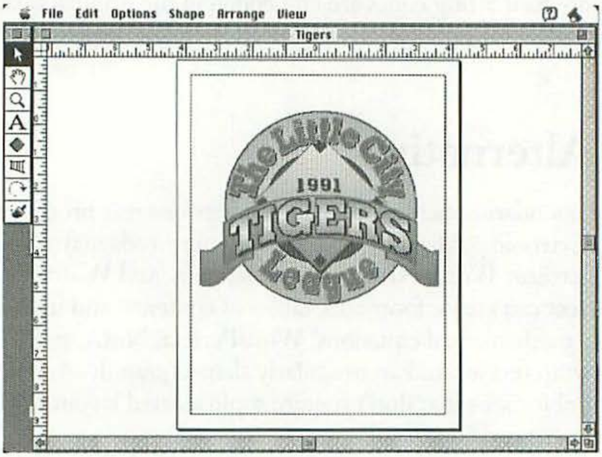
For checking spelling and hyphenation, you'll want a standard dictionary (such as Webster's *Ninth New Collegiate Dictionary,* Merriam-Webster, 1986). (Webster's is available on CD-ROM from Highlighted Data, Inc.) To learn about the ins and outs of punctuation, grammar, and style, buy a style manual such as *The Chicago Manual of Style* (University of Chicago Press, 1982) or *Words into Type* (Prentice-Hall, 1974).

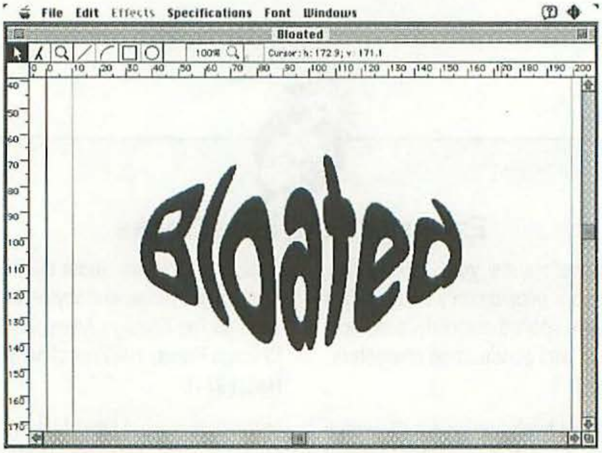
In the meantime, I provide some guidelines for punctuation and other typographic details in Chapter 11.

QUICK TIPS

Display Type Made Easy

If you are creating advertisements, large headlines, or package designs, you may want a display type program such as Brøderbund's TypeStyler (top) or Letraset's LetraStudio (bottom). These programs let you stretch, condense, squeeze, and otherwise alter the appearance of text (see the figures below). Finally, if you plan to include graphics in your publications, see Chapter 13 for a look at painting and drawing programs.

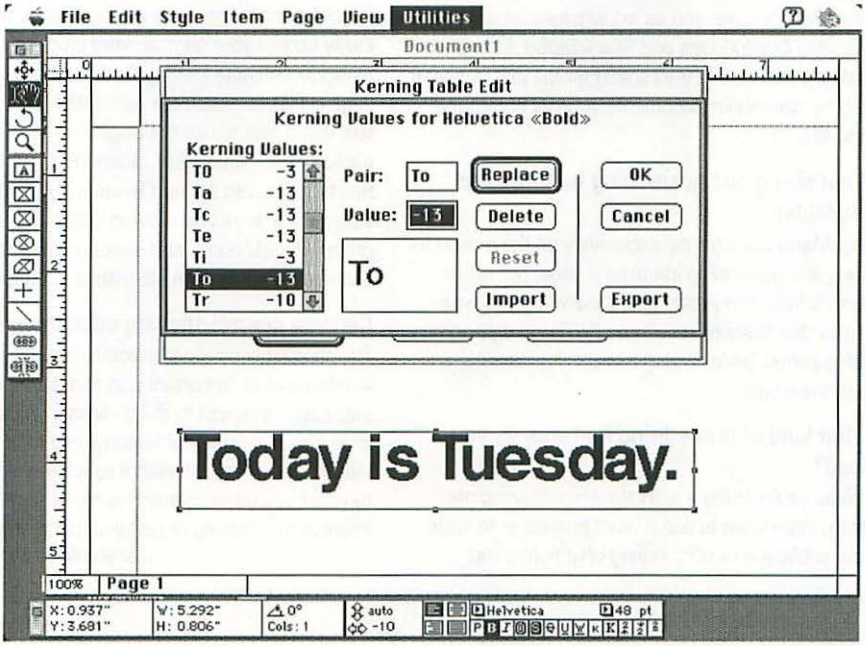



File Edit Effects Specifications Font Windows
Bloated
100%
Cursor: h: 172.9; v: 171.1
Bloated

If you're new to publishing or if you don't need exotic color-separation and text-spacing features, you may consider an entry-level publishing package such as Aldus Personal Press or Timeworks' PublishIt Easy. Personal Press is easier to learn and use, but PublishIt Easy has the edge in features and speed. You may also consider an integrated program such as ClarisWorks or Microsoft Works. Both enable you to mix text, graphics, and even spreadsheet data on a page.

Illustration programs such as Aldus FreeHand and Adobe Illustrator are ideal for creating small, graphically-oriented publications, especially ones requiring special typographic effects. Adobe Illustrator handles text particularly well, even enabling you to link frames so that text flows from one to another (see Figure 9-4 "Kerning Characters").

Then there's Multi-Ad Service's Multi-Ad Creator, which lets you create documents containing numerous versions of a single page. With its PageMaker-like place-and-go layout scheme, built-in library of PostScript special text effects, and superb style sheet features, it's an excellent choice for producing display advertisements and other single-page publications.



Kerning Table Edit

Kerning Values for Helvetica «Bold»

Kerning Values:

TO	-3
Ta	-13
Tc	-13
Te	-13
Ti	-3
To	-13
Tr	-10

Pair: To

Value: -13

To

Today is Tuesday.

X: 0.937"
Y: 3.681"
W: 5.292"
H: 0.806"
0°
Cols: 1
auto
-10
Helvetica
48 pt

Figure 9-4: Kerning Characters The legibility of text, especially of large headlines such as the one visible here, is improved when key letter pairs are kerned. Automatic kerning features rely on kerning tables built into a font by its designer. QuarkXPress, ReadySetGo, and PageMaker 5 let you edit kerning tables to suit your typographic tastes. (QuarkXPress' kerning table editor is shown here.) You can also use third-party kerning table utilities such as The Software Shop's Kern-Rite and Pairs Software's KernEdit.

If you're determined to stick with a mainstream publishing program, you will find some shopping advice in the Quick Tips box, "A Publishing Program Shopping List."

QUICK TIPS

A Publishing Program Shopping List

The best way to find a publishing program is to assess your needs, and then find the program that best meets them. Be sure to choose a program whose operating style you can live with. Here are some features and factors to consider.

What is its maximum document length?
Early publishing programs were limited to short documents of about 16 pages. Today's programs support much longer documents, 999 pages in PageMaker's case, and as many pages as will fit on disk with QuarkXPress and ReadySetGo. FrameMaker is particularly well suited for the production of lengthy, structured documents such as books and manuals.

What sizing and positioning features are available?
PageMaker used to rely exclusively on the mouse for sizing and positioning items on a page, but it, like QuarkXPress and ReadySetGo, now lets you type values that describe an element's size and position. Some people prefer typing these values to dragging with the mouse.

What kind of text-editing features do you need?
Unless you're using a workstation publishing program, you'll want to use a word processor to write your publication's text, saving your publishing program's text-editing features for simple tasks such as last-minute corrections and revisions. QuarkXPress and ReadySetGo each provide search-and-replace features and other rudimentary text-editing functions. PageMaker provides these same goodies, but also adds an extremely useful *story editor,* a mini word processor that makes it easy to revise text and even write small passages within PageMaker.

PageMaker also provides linking options that let you easily update your original word processor files to reflect last-minute editing changes. Updating your original files to match the publication's text is important if you plan to use the originals again in other publications. PageMaker, QuarkXPress, and ReadySetGo also support System 7's publish and subscribe features for moving data between programs. PageMaker 5 also supports Microsoft's OLE data-exchange system, described in Chapter 28.

Can you control spacing adequately?
The spacing between characters and between words plays an important part in determining a publication's overall legibility. Most publishing programs offer a variety of features that improve intercharacter and interword spacing. *Kerning* features let you move characters closer together to improve the spacing of certain letter combinations,

(continued on the next page)

(continued from the previous page)

such as To and AT (see Figure 9-4 "Kerning Characters"). An automatic kerning feature enables the publishing program to kern characters based on kerning tables that are built into most fonts by their developers. A manual kerning function lets you fine-tune spacing by hand to improve the spacing of large text such as headlines. Word spacing features let you increase or decrease interword spacing.

A track kerning feature lets the program uniformly decrease intercharacter spacing as the type size increases. Most publishing programs provide automatic and manual kerning, but only Aldus PageMaker, QuarkXPress, and ReadySetGo provide track kerning. Ventura Publisher claims to provide tracking, but its tracking feature simply tightens intercharacter spacing, and isn't dependent on type size.

You'll often hear QuarkXPress zealots praise their program for being more precise than PageMaker because QuarkXPress allows smaller kerning and positioning increments ($\frac{1}{20{,}000}$ em compared to PageMaker's $\frac{1}{100}$ em). But the fact is, at most type sizes, $\frac{1}{20{,}000}$ em is finer than almost any output device can render. For example, at 3,386 dots per inch, $\frac{1}{20{,}000}$ em has no effect on type sizes below 400 point. Mechanical output devices — with their belts, rubber rollers, and film that expands and contracts with the weather — aren't precise enough to render such minute measurements. In short, you may feel better specifying a teeny kerning or positioning value in QuarkXPress, but you're unlikely to see the difference in your hard copy.

Can the program import your documents?

All publishing programs can import word processing and graphics files created by popular Mac programs, and some programs, such as WordPerfect, also support popular IBM PC file formats. But it's always a good idea to verify in advance that a publishing program will be able to import the types of documents you create.

Is there third-party support?

Aldus PageMaker and QuarkXPress users can choose from a large variety of training materials and software add-ons that enhance their programs. Add-ons range from utilities that arrange pages for booklet printing to database publishing software such as ElseWare's DataShaper (for PageMaker) and Em Software's xdata (for QuarkXPress). DataShaper and xdata let you use the data stored by a database management program to create a variety of publications. For example, a video rental store might use its videotape database to produce catalogs for customers, inventory reports showing which tapes are checked out, and labels for the videotapes themselves. Database publishing simplifies the production of publications whose text is sorted and organized into categories. Typical database publishing applications include catalogs, classified advertisements, telephone directories, and television listings.

I give more details on software add-ons for PageMaker and QuarkXPress in the next chapter.

What are your needs and limitations?

To pick the right program, first determine the types of publications you will create. Brochures and menus, newsletters, books, scientific papers, advertisements — every piece has its demands, and some programs meet them better than others. Next, consider your hardware. Low-end packages run on Mac Classics, SEs, and Pluses, but most other programs crawl on them. Finally, consider yourself — your design and layout skills and the extent to which you want to immerse yourself in publishing minutia.

Putting the Issue to Bed

Before you take the publishing plunge, prepare yourself: It's hard work. The Mac makes producing an attractive, readable page easier than it used to be, but that doesn't mean it's a breeze. To get results that do justice to your message, you need to develop an awareness of design and typography.

One way to get off to a good start is to hire a graphic designer to create a conceptual framework — a foundation on which you can build each issue. Many companies also sell canned template documents for common publishing jobs like newsletters and reports. Most programs also come with a library of templates that you can use as-is or modify to suit your tastes. Even with one of these approaches, however, the quality of your publication's typography is still up to you. I examine typographic considerations in Chapter 11.

When you start up that page-layout program, you assume a responsibility for conveying ideas in an aesthetically pleasing way, both visually and verbally. Ignore that responsibility and you ignore centuries of printing tradition. And it isn't just the designers and typographers of the world who'll notice. They may not be aware of it, but your readers are excellent judges of good design and typography. Don't let them find you guilty of crimes against legibility.

CHAPTER 9 CONCEPTS AND TERMS

- Investing some time and effort in learning a sophisticated publishing program can allow you to do what used to require several specialists and expensive equipment.
- The two most popular publishing programs are Aldus PageMaker and QuarkXPress, but for lengthy documents and technical manuals, workstation programs such as FrameMaker can be more appropriate.
- When shopping for a publishing program, features and factors to consider include maximum document length, positioning and sizing features, text-editing features, text-spacing controls, and third-party support.
- Although electronic publishing makes it easier to produce printed materials, you need to develop an awareness of design and typography in order to get the best results.

camera ready
A page that's ready to be sent to a printer for printing.

code-oriented programs
Also known as *command-driven* or *batch-processing* programs, a category of publishing programs that don't rely on the mouse for layout but instead require typed formatting codes in the text.

color separation
An essential step in producing color publications, the process of dividing a color page into cyan, yellow, magenta, and black components and printing a separate page for each ink.

comp
Short for *comprehensive,* a detailed drawing that shows how a final printed piece will look.

copy
Publishing jargon for text.

copyfitting
A tedious process in which a designer or typesetter uses formulas to calculate how much space a given amount of text will require when printed in a particular font and size.

crop marks
Those weird round circles in British farmers' fields, supposedly created by aliens. Also, horizontal and vertical lines that indicate a page's boundaries.

dummy
Anyone who thinks that a publishing program will automatically make him or her a graphic artist. Also, a preliminary layout that shows how and where the text and graphics will go on each page.

halftone
A technique of converting a photograph into a series of dots.

imagesetter
A kind of printer that produces its hard copy on photographic film or paper.

line art
Black-and-white drawings or graphs.

mark up
The process of annotating a page of copy to indicate the desired fonts, line lengths, spacing, and other specifications.

master pages
In a publishing program, special pages for holding page numbers and other elements that repeat on each page or on odd- and even-numbered pages.

mechanical
A piece of heavy cardboard upon which the text and graphics for a page are pasted.

optical character recognition
A software technology that enables a computer to "read" typed or typeset pages of text and create disk files you can edit and reformat with a word processor.

registration marks
Special symbols printed outside of the margins that a printing shop uses to align the plates that print each color.

rules
Lines that appear on a page.

scanner
A photocopier-like device that creates electronic image files from photographs or other artwork.

spot color
A single color dropped into certain page elements (such as a headline or a horizontal bar) used to grab readers' attention.

spread
A low-fat alternative to butter. Also, two facing pages.

strip
A printing industry process in which page negatives are cut into place and prepared for printing.

CHAPTER TEN

Desktop Publishing Tips and Techniques

IN THIS CHAPTER

- Performing common publishing tasks in Aldus PageMaker and QuarkXPress
- Using your program's tiling feature for billboard publishing
- Ensuring your publications are TC — typographically correct
- Making the most of keyboard shortcuts to kern text, position items, and more
- Exploring add-ons that extend the power of your page-layout program

Today's publishing programs are capable of turning out top-quality publications. But are you? If you were a publishing professional before the Mac appeared, chances are you've made the transition to the desktop without too much pain (assuming you didn't lose your job in the process — according to the International Typeface Corporation, there are half as many typesetting houses today as there were before the Macintosh was introduced).

But if you're new to publishing — if you used to produce that newsletter using an IBM Selectric and a couple of type balls — you may be overwhelmed by the array of options that programs such as Aldus PageMaker or QuarkXPress provide. Smart quotes, kerning, tracking, letter spacing, spot color — it's almost enough to make you long for the old Selectric.

Some publishing neophytes address this feature onslaught by ignoring it, relying on their program's default settings for page size, spacing, and the rest. As a result, many desktop publications look like desktop publications — the efforts of someone with a powerful program but without the knowledge to fully apply it.

Fortunately, it's not too difficult to take the desktop out of desktop publishing. In this chapter, I'll spotlight several techniques for adding polish to publications. Although the instructions here apply to QuarkXPress 3 and PageMaker 5, similar concepts apply to all publishing programs, and even to some word processors.

Page Size Decisions

One of the most basic decisions behind any publication is the choice of a page size, or *trim size*. Chances are you frequently opt for the 8 ½ by 11-inch page size offered by QuarkXPress and PageMaker. After all, that's probably the largest paper size your laser printer can handle, and it's the most common size used by print shops.

But before okaying that New dialog box, consider the options. For starters, consider a *landscape*, or wide, orientation — 11 by 8 ½ inches. It may work well for a small poster, for a publication with wide graphics, or for a calendar. (By the way, the more common orientation is called *portrait*, or tall.)

If you're a bit more ambitious, consider turning that letter-sized sheet into a two-sided job. By folding the sheet one or two times, you can create an attractive booklet, menu, or brochure (see Figure 10-1 "One Fold and Two Folds"). A two-sided job costs more to print, but exactly how much more depends on many factors, including the quantity you print, the paper you use, the number of printers in your area, and the type of equipment each printer has. It's a good idea to get several estimates.

If you're printing a small run on your laser printer, investigate the wide selection of specialty papers available from mail-order houses such as Paper Direct (800-272-7377). Besides stiff card stocks, Paper Direct also sells paper preprinted with splashes of color and interesting patterns around which you can structure your design. (See Chapter 30 for more details on alternative paper stocks.)

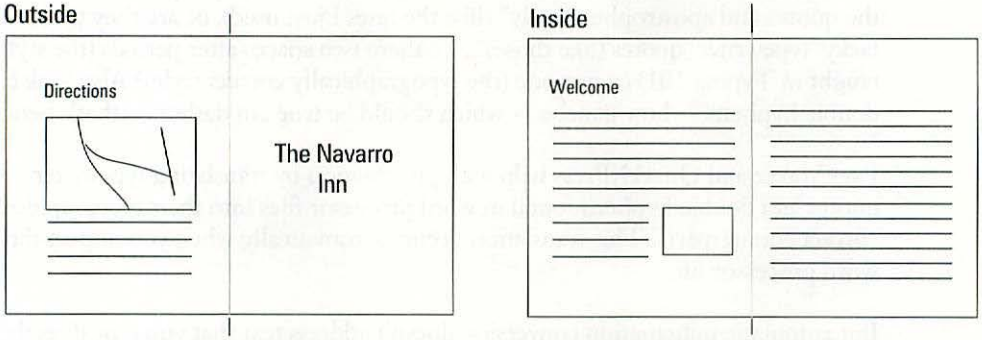
If you're producing a poster or newsletter, don't be caged in by your laser printer's maximum paper size. You can produce tabloid- or even billboard-size publications by using your program's *tiling* feature: Simply specify the desired final page size when setting up the document, and then activate the tiling option when you print. You'll get a raft of letter-sized pages that you can tape together or paste up on layout board. A large size such as tabloid (11 by 17 inches) costs more to print than a letter-size publication, but gives you more flexibility in designing your layout.

QUICK TIPS

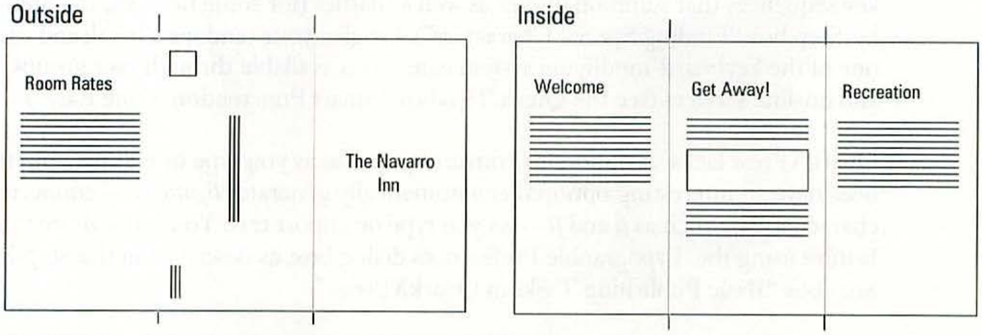
Making Banners at the Local Copy Shop

Many copy shops have blueprint photocopiers that can accept originals up to a few feet wide, with no length limit. You can produce some mighty impressive banners by using your publishing program's tiling feature and then photocopying the assembled page.

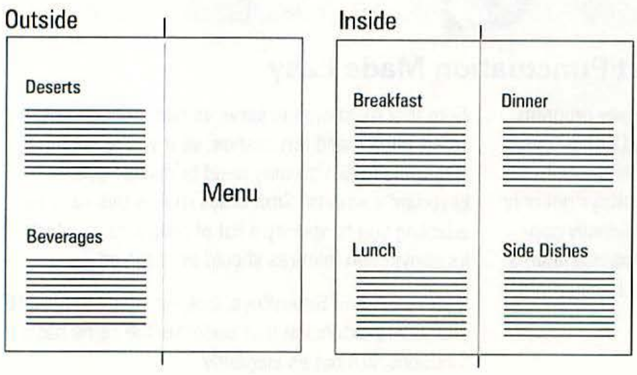
ONE FOLD AND TWO FOLDS



A single fold yields a four-page booklet. A horizontal orientation is usually preferable, since it allows for wider text margins. How to: Specify a wide page orientation, and then create a ruler guide at the 5-1/2 inch mark. You may also want to draw vertical rules above and below the fold point; these crop marks will indicate where the printer should fold the page.



Two fold points yield a six-page booklet that folds nicely for mailing or for insertion in a standard business envelope. How to: Specify a wide page orientation, and then create ruler guides and crop marks at the 3-7/8 and 8-inch marks. To create a mailing address on the back page, rotate the text 90 degrees.



A vertical orientation may be appropriate for a phone directory or menu, where narrow lines are common. How to: Create a ruler guide at the 4-1/4-inch mark and draw crop marks to indicate the fold point.

Figure 10-1: One Fold and Two Folds

Are You Typographically Correct?

The easiest way to spot a desktop-published job is to look at the punctuation. Are the quotes and apostrophes “curly” (like the ones I just used), or are they those tacky 'typewriter' quotes (like those)? Are there two spaces after periods (the style taught in Typing 101) or just one (the typographically correct style)? Also look for double hyphens -- how gauche -- which should be true em dashes — that’s better.

PageMaker and QuarkXPress help with punctuation by translating typewriter quotes and double hyphens found in word processor files into their typographically correct counterparts. This translation occurs automatically when you import the word processor file.

But automatic punctuation conversion doesn’t address text that you type directly within the publishing program, such as headlines and last-minute corrections. You can use PageMaker’s smart quotes option to automatically convert quotes as you type, but that won’t guard against double word spaces or double hyphens. That’s your job. If you use QuarkXPress, you have to remember to use the finger-tangling key sequences that summon quotes as well as dashes (for some help, see the Step-by-Step box “Finding Special Characters”). Or give your tendons a break and use one of the keyboard-modifying system extensions available through user groups and on-line services (see the Quick Tips box “Smart Punctuation Made Easy”).

QuarkXPress lacks an option for converting quotes as you type or edit text, but it does have an interesting option that automatically generates *ligatures* — connected character pairs such as *fi* and *fl* — as you type or import text. You can activate this feature using the Typographic Preferences dialog box, as described in the Step-by-Step box “Basic Publishing Tasks in QuarkXPress.”

QUICK TIPS

Smart Punctuation Made Easy

You can add a smart quotes feature to any program by using a free system extension called SmartKeys, written by Maurice Volaski and available through user groups and on-line services. SmartKeys not only converts quotes as you type, it also optionally converts double hyphens into em dashes, uses ligatures when available, and prevents you from typing more than one consecutive space.

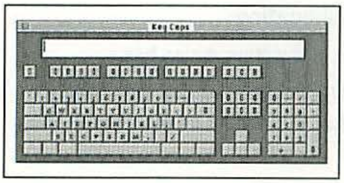
Note that most on-line services can’t recognize smart quotes and em dashes, so if you’re creating electronic mail, you may need to disable your keyboard’s smarts. SmartKeys makes this easy by enabling you to specify a list of programs in which its conversion features should be disabled.

If you can’t find SmartKeys, look for Quote Init, a $15 shareware extension that performs the same basic functions, but not as elegantly.

Finding Special Characters

To help them remember the keystrokes that summon accents, fractions, and other special characters, typesetters often refer to printed charts called keyboard layouts. For desktop typographers, the Mac provides an electronic keyboard layout chart called the Key Caps desk accessory, which displays an on-screen keyboard with a text-entry box above it.

The Mac's special characters are accessed through combinations of the Option and Shift keys. When you press these keys, Key Caps updates its graphical keyboard to reflect the characters they summon.



To locate a certain character in a given font:

1. **Choose the font's name from the Key Caps menu.**
   This is an important step, because not all fonts provide the same characters in the same keyboard locations. (Adobe's Caslon expert set is shown at left.)
2. **Press Option with and without Shift until you locate the character on Key Caps' keyboard.**
3. **When you find the character, continue holding down the Option and/or Shift key, and then click on the character's key with the mouse.**
   The character appears in the text entry window above the keyboard. Repeat this step for any additional characters you need (such as the slash and denominator to complete a fraction).
4. **Select the character(s) in the text-entry window and choose Copy or Cut from the Edit menu.**
5. **Return to your document, position the blinking insertion point where you want the character to appear, and then choose Paste. If necessary, change the font to the desired typeface.**

Other tips to consider when using Key Caps include the following:

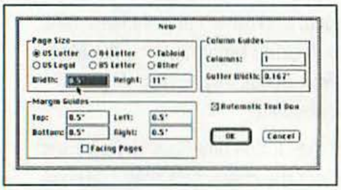
- ❖ As an alternative to copying the character to the Clipboard, you can type the character directly by pressing its appropriate key, as displayed by Key Caps.
- ❖ Close Key Caps' window when you're done with it; leaving it open while you type in other programs slows the Mac as Key Caps' keys flash merrily in the background.
- ❖ Creating an accented character such as *é* or *ñ* requires a two-step key sequence. First, press Option along with the accent's character. Next, type the character that will appear under the accent. For example, to create an *n* with a tilde over it (ñ), press Option-N and then type an **n**.

STEP-BY-STEP

Basic Publishing Tasks in QuarkXPress

This box shows how to perform the tasks described in this chapter using QuarkXPress.

To specify a wide rather than tall page orientation:

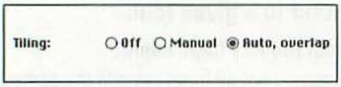


● US Letter ○ A4 Letter ○ Tabloid
○ US Legal ○ B5 Letter ○ Other
Width: 8.5" Height: 11"
Columns: 1
Gutter Width: 0.167"
☒ Automatic Text Box
Top: 0.5" Left: 0.5"
Bottom: 0.5" Right: 0.5"
☐ Facing Pages

1. **Type the appropriate dimensions in the New dialog box's Width and Height boxes.**

   If you've already started a publication and need to change its orientation, choose Document Setup from the File menu and type the appropriate dimensions.

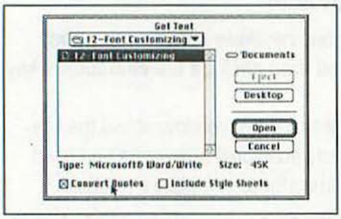
To create an oversized publication:



Tiling: ○ Off ○ Manual ● Auto, overlap

1. **Specify the final page size in the New dialog box.**
2. **When you're ready to print, choose Print and then click the Manual or Auto tiling button, depending on the desired tiling scheme.**

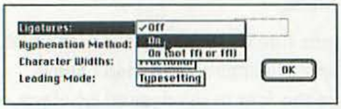
To convert quotes and double hyphens when importing text:



Type: Microsoft® Word/Write Size: 45K
☒ Convert Quotes ☐ Include Style Sheets

1. **Check the Convert Quotes box in the Get Text dialog box.**

To automatically generate ligatures:

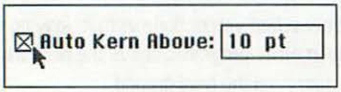


Ligatures:
Hyphenation Method:
Character Widths:
Leading Mode: Typesetting

1. **Choose Typographic from the Preferences submenu (in the Edit menu).**

   The Typographic Preferences dialog box appears.
2. **Choose the On option from the Ligatures pop-up menu.**
3. **Click OK or press Return.**

To activate tracking and automatic kerning:



☒ Auto Kern Above: 10 pt

1. **Choose Typographic from the Preferences submenu.**
2. **Check the Auto Kern Above box.**

   If you like, you can specify a type-size threshold for automatic kerning.

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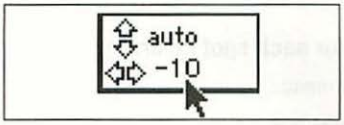
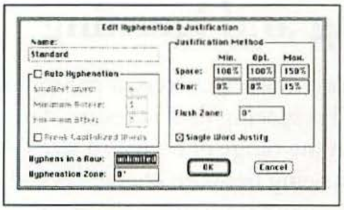


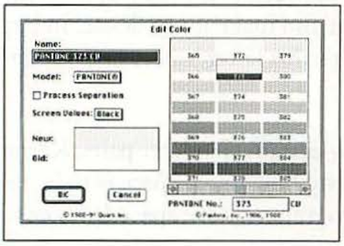
To manually kern two characters:

1. **Place the blinking insertion point between the two characters you want to kern.**
2. **Press ⌘-Shift-{ or, for finer kerning, ⌘-Option-Shift-{.**
   For more kerning shortcuts, see Table 10-1. You can also click the kerning arrows in QuarkXPress' measurements palette, or type a kerning value in the area to the right of the kerning arrows. Type a negative value (for example, -2) to reduce the spacing. You can also kern a range of characters using these techniques.



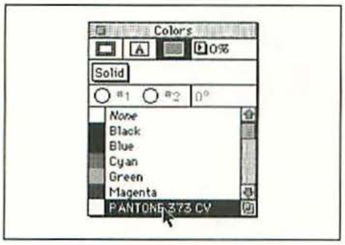
To edit the standard H&J or create a new one:

1. **Choose H&Js from the Edit menu.**
2. **To edit the standard H&J, double-click the H&J named Standard. To create a new H&J, click the New button and then name the new H&J.**
3. **Specify the desired spacing and hyphenation settings in the Edit H&J dialog box.**
4. **Click OK or press Return.**
5. **Click Save.**



To add a Pantone color to QuarkXPress' color palette:

1. **Choose Colors from the Edit menu.**
2. **Click New.**
   The Edit Color dialog box appears.
3. **Choose Pantone from the Model pop-up menu.**
4. **Select the desired Pantone color and then click OK.**
5. **Click the Save button in the Colors dialog box.**



To assign a color to text or to a graphic element:

1. **Select the text or element.**
2. **Click the color name in the Colors palette.**
   If the Colors palette isn't visible, choose Show Colors from the View menu.

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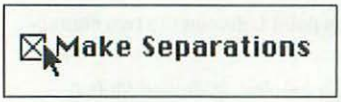


To print the separations for each spot color:

1. **Choose Print from the File menu.**
2. **Check the Make Separations box.**
   To help the print shop align the plates correctly, you may also want to check the Registration Marks button. See the *Using QuarkXPress* manual for more color details.

Better Spacing Through Tracking and Kerning

To determine how much space to put between words and characters, a publishing program relies on information built into a font. This spacing data is designed to (and usually does) produce attractive results within the range of body text sizes — roughly 8 to 12 points. But with larger sizes, the spacing between characters and words can appear exaggerated. By tightening the spacing using your program's *tracking* and *kerning* features, you can improve the legibility of headlines (see Figure 10-2 "Tracking and Kerning").

A tracking feature automatically adjusts the space between every character. With small sizes, spacing is increased to open up the text and make it less dense. In large sizes, spacing is decreased to tighten up the text. It's this latter aspect of tracking that is useful for headlines.

Kerning involves adjusting the space between only certain character pairs. Kerning features come in two flavors: Manual lets you specify how much space is to be removed and from where, and automatic lets the program remove space from certain

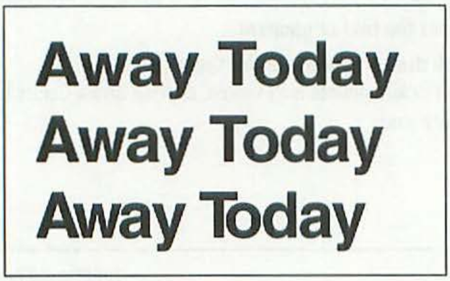


Figure 10-2: Tracking and Kerning To improve headline spacing, start by tightening overall spacing, and then selectively kern where necessary. Begin with a 24-point Helvetica Bold headline (top) with no kerning, apply PageMaker's Normal track option (middle) to tighten overall spacing, and then use selective manual kerning (bottom) to finish the job.

letter pairs such as *To*, based on information built into the font you're using. Automatic kerning adds polish to body text, but for large headlines, you'll want to use manual kerning to achieve the best look (see Table 10-1 for kerning specifics). Don't kern too tightly; characters should not touch. You may need to zoom in on the characters you're kerning to see the results. Or better yet, print some test pages as you work.

PageMaker sports the best tracking features of any publishing program, offering five tracking commands ranging from Very Loose to Very Tight. For tightening up headlines and other large sizes, try the Normal track for starters. As for kerning, PageMaker is preset to automatically kern sizes above 12-point; you can change that size value using the Spacing Attributes dialog box — choose Paragraph from the Type menu and then click the Spacing option. (Specifying a smaller value slows PageMaker's performance at formatting body text.)

PageMaker 5 builds on the program's strong typography features by including what Aldus calls an "expert kerning" module that lets you create custom kerning pairs for any font. PageMaker 5 also lets you edit tracking and kerning data to fine-tune spacing for your particular jobs and tastes.

Table 10-1
Kerning from the Keyboard

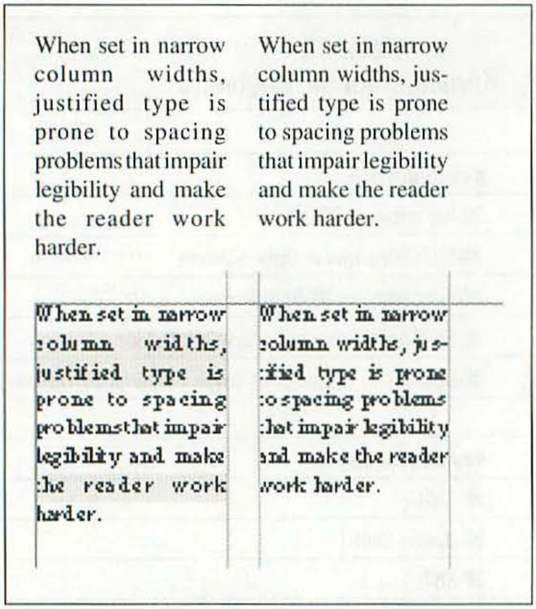
Using PageMaker	
Kern Option	***Key Sequence***
Tighten coarse	⌘-left arrow or ⌘-Delete
Tighten fine	⌘-Shift-left arrow or Option-Delete
Loosen coarse	⌘-right arrow or ⌘-Shift-Delete
Loosen fine	⌘-Shift-right arrow or Option-Shift-Delete
Remove all manual kerning	⌘-Option-K or Option-Shift-keypad Clear or ⌘-Option-Shift-Delete
Using QuarkXPress	
Kern Option	***Key Sequence***
Tighten coarse	⌘-Shift-{
Tighten fine	⌘-Option-Shift-{
Loosen coarse	⌘-Shift-}
Loosen fine	⌘-Option-Shift-}

In PageMaker, automatic kerning is a paragraph-level attribute — you can turn it off or on for a given paragraph. To use (or disable) automatic kerning for only certain paragraphs, select those paragraphs before choosing the Paragraph command.

Better Spacing with Justified Type

The type in newsletters and magazines is often *justified* — aligned against the left and right margins. To justify text, a program adds space between characters and words. And therein lies the potential for poor spacing. With narrow columns, a program often has to insert too much space between words or characters, resulting in distracting rivers of white space (see Figure 10-3 "Clear the Rivers").

With a word processor, there's little you can do to avoid rivers aside from hyphenating the text so that more fits on each line. (You can also reduce the point size or increase the column width, but these measures may compromise your original design.) But publishing programs give you far more control over interword and



When set in narrow column widths, justified type is prone to spacing problems that impair legibility and make the reader work harder.

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When set in narrow column widths, justified type is prone to spacing problems that impair legibility and make the reader work harder.

Figure 10-3: Clear the Rivers Note the river of white space (top) that runs through the second, third, and fourth lines of the left example. At right, the problem is fixed by hyphenating a word. When PageMaker's Show Layout Problems option is active (bottom), the program highlights poorly spaced lines.

intercharacter spacing. By tweaking your H & J (hyphenation and justification) settings, you can keep those rivers within their banks.

Tips for your space

Both QuarkXPress and PageMaker enable you to specify three characteristics for spacing — minimum, the least amount of space that can be put between characters or words; optimum, the spacing specified by the font's designer; and maximum, the largest allowable amount of intercharacter or interword spacing. By adjusting any or all three of these settings for both word and character spacing, you can finely control how text is justified.

Because every publication is different, there are no specific settings that guarantee good justification. Here are two general rules; experiment to find the ideal spacing settings for a specific job.

- Increasing the maximum amount of letter spacing results in fewer large spaces between words, but too much letter spacing can cause words to appear to run together.
- Decreasing the amount of space between characters allows more text to fit on a line, but the text can appear too dense.

Hyphenating with discretion

Sometimes the easiest way to fix a spaced-out line is by hyphenating. QuarkXPress and PageMaker have automatic hyphenation features and also enable you to manually insert *discretionary hyphens.* A discretionary hyphen tells the program, "If the letters to the left will fit on the previous line, divide the word here and insert a hyphen. If they won't fit, don't divide the word." If reformatting or editing changes the line breaks later, the hyphen disappears but the discretionary hyphen code remains. Discretionary hyphens are sometimes called soft hyphens to distinguish them from hard (permanent) ones.

To create a discretionary hyphen in either program, position the insertion point at the possible word break and then press ⌘-hyphen.

QuarkXPress calls a set of spacing and hyphenation specifications an H&J, and lets you create as many H&Js as you like. If you modify or create an H&J when no documents are open, your changes will be available in all future documents you create.

PageMaker has a unique feature that highlights lines with bad spacing, making it easier to spot them. To activate the feature, choose Preferences from the Edit menu and then check the Loose/Tight Lines box.

A Spot of Color

A good way to enliven a publication is with color. I'm not talking about full-color photographs or illustrations, which can be technically complex to work with and expensive to print, but spot color — color added to elements that would otherwise be black, such as headings, lines, and boxes. Using spot color is an easy way to add emphasis and pizzazz to a page, and it doesn't require any exotic hardware. You can even work with spot color on a monochrome Mac such as a Classic, although you obviously won't see the colors on screen.

When you print a publication containing spot color, you tell the program to print a separate page, or *overlay,* for each spot color you use. You then supply these pages to the print shop, which creates a printing plate for each color.

Because a multicolor job must be run through a press more than once (or through a press capable of printing more than one color at once), it costs more than if you used just one color. Costs for multicolor jobs can vary dramatically from one printer to the next. If one printing company has a press designed to print two-color jobs, you'll get a better price than if you used a printer that runs the publication through a one-color press two times.

Just as paint stores use standardized swatch books, the printing industry uses standardized color-matching systems that let you choose hues. One of the most popular systems is called Pantone. Both PageMaker and QuarkXPress let you assign Pantone colors and see them on a color monitor. When you take your artwork to the printer, you specify by number which Pantone colors you want — as in Pantone 350.

Both PageMaker and QuarkXPress let you assign color to elements by clicking an on-screen color palette. Normally, the palette lists only a few basic colors such as red, green, and blue. You need to use a command to add other colors to the palette (see the Step-by-Step boxes on basic publishing tasks in QuarkXPress and PageMaker).

Expanding Your Page-Layout Program

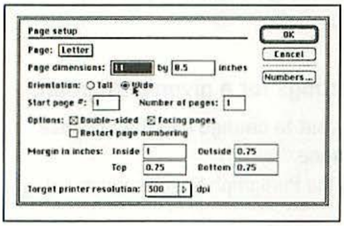
No program can be all things to all people. That truism is the driving force behind one of the latest trends in desktop publishing software — extensibility. Just as you can buy plug-in boards and external add-ons that enhance your Mac, you can buy software that plugs into QuarkXPress or Aldus PageMaker that adds new features.

To understand why extensibility is desirable in publishing software, walk through any large publishing department. Of course you'll find typesetters and paste-up

STEP-BY-STEP

Basic Publishing Tasks in Aldus PageMaker

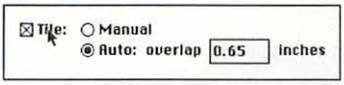
This box shows how to perform the tasks described in this chapter using Aldus PageMaker.


Page setup
Page: Letter
Page dimensions: 11 by 8.5 inches
Orientation: ○ Tall ● Wide
Start page #: 1 Number of pages: 1
Options: ☒ Double-sided ☒ Facing pages
☐ Restart page numbering
Margin in inches: Inside 1 Outside 0.75
Top 0.75 Bottom 0.75
Target printer resolution: 300 dpi

To specify a wide rather than tall page orientation:

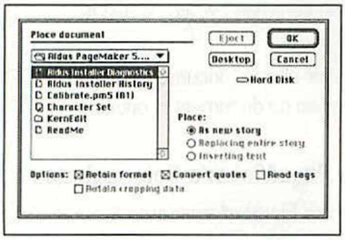
1. **Click the Wide button in the Page setup dialog box.**

   If you've already started a publication and need to change its orientation, choose Page Setup from the File menu and choose or specify the desired dimensions.


☒ Tile: ○ Manual
● Auto: overlap 0.65 inches

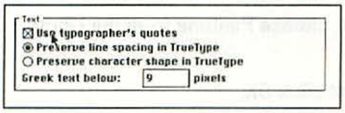
To create an oversized publication:

1. **Choose Page Setup from the File menu.**
2. **Specify the final page size.**
3. **When you're ready to print, choose Print and then click the Paper button.**
4. **Check the Tile box in the Paper Options dialog box.**


Place document
Aldus PageMaker 5....
Aldus Installer Diagnostics
Aldus Installer History
Calibrate.pm5 (A1)
Character Set
KernEdit
ReadMe
Hard Disk
Place:
● As new story
○ Replacing entire story
○ Inserting text
Options: ☒ Retain format ☒ Convert quotes ☐ Read tags
☐ Retain cropping data

To specify that PageMaker convert quotes and double hyphens when importing a file:

1. **Check the Convert quotes box that appears in the Place document dialog box.**


Text
☒ Use typographer's quotes
● Preserve line spacing in TrueType
○ Preserve character shape in TrueType
Greek text below: 9 pixels

To specify that PageMaker convert quotes as you type or edit text:

1. **Choose Preferences from the File menu.**
2. **Click the Other button.**

   The Other Preferences dialog box appears.
3. **Click the Use typographer's quotes box.**
4. **Click OK or press Return.**

   The Preferences dialog box reappears.
5. **Click OK or press Return.**

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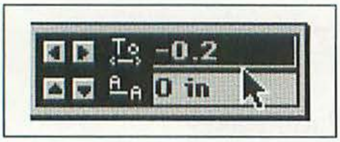
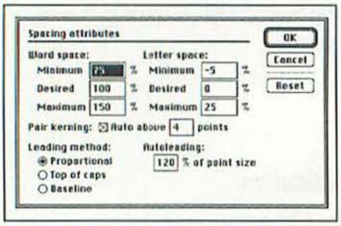


To manually kern two characters:

1. **Place the blinking insertion point between the characters you want to kern.**
2. **Press ⌘-Delete or, for finer kerning, Option-Delete.**

   For more kerning shortcuts, see Table 10-1. You can also kern a range of characters using the same key sequences; simply select the characters first. You can also use the Control palette to manually kern (shown at left).



Spacing attributes

Word space:
Minimum 75 %
Desired 100 %
Maximum 150 %

Letter space:
Minimum -5 %
Desired 0 %
Maximum 25 %

Pair kerning: ☒ Auto above 4 points

Leading method:
● Proportional
○ Top of caps
○ Baseline

Autoleading:
120 % of point size

To change the spacing settings for a given paragraph:

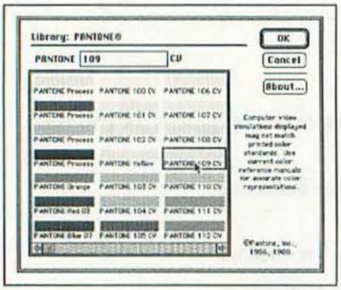
1. **Select the paragraph you want to change and then choose Paragraph from the Type menu.**

   Pressing ⌘-M also displays the Paragraph Specifications dialog box.
2. **In the Paragraph Specifications dialog box, click the Spacing button.**

   The Spacing attributes dialog box appears.
3. **Type the desired spacing values in the appropriate boxes.**
4. **Click OK or press Return.**

   Other tips to keep in mind when changing spacing settings include the following:

   - ❖ To change the default spacing settings for an entire document, use the Paragraph command when no text is selected.
   - ❖ To change the defaults for all new documents, use the Paragraph command when no document is open.



Library: PANTONE®

PANTONE 109 CV

Computer video simulations displayed may not match printed color standards. Use current color reference manuals for accurate color representations.

©Pantone, Inc., 1986, 1988.

To add a Pantone color to PageMaker's Color palette:

1. **Choose Define Colors from the Element window.**
2. **Click New.**
3. **In the Edit Color dialog box, choose Pantone from the Libraries pop-up menu.**
4. **Select the desired color and click OK.**

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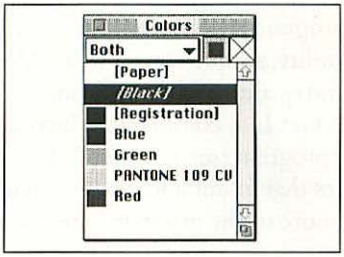
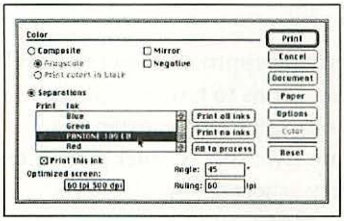


To assign a color to text or to a graphic element such as a rule:

1. **Select the text or element.**
2. **Click the color name in the Colors palette.**

   If the Colors palette isn't visible, choose Color Palette from the Windows menu or use the ⌘-K keyboard shortcut.


Color

○ Composite

● Grayscale

○ Print colors in black

☐ Mirror

☐ Negative

● Separations

Print Ink: PANTONE 109 CU

☒ Print this ink

Optimized screen: 60 lpi 500 dpi

Angle: 45°

Ruling: 60 lpi

To print overlays for each spot color:

1. **Choose Print from the File menu.**
2. **Click the Color button.**

   The dialog box changes to display color-printing options.
3. **Click the Separations button.**
4. **Select the name of each spot-color ink you want to print, and check the Print this ink box.**

   To print all colors, click Print all inks.
5. **Click Print or press Return.**

   For more details on working with color, see the PageMaker reference manual.

artists, but you'll also find the specialists every publishing niche relies on. Darkroom technicians prepare the publication's images. Proofreaders and editorial assistants check spelling and compile indexes. Strippers organize the elements on a page and then organize a publication's pages so that they're in the correct order after being printed, cut, folded, and bound. Research assistants cull through databases and wire service reports. Managing editors monitor the big picture and shepherd stories through the production process. Advertising coordinators sell, track, and manage ad space.

An equivalent publishing add-on exists for every one of these job specialties. QuarkXPress has over 60 extensions and standalone utilities. Far fewer are available for PageMaker, which is a relative latecomer to the extensibility party.

When you choose between PageMaker and QuarkXPress, you're also buying into an extensibility technology. Understanding how those technologies differ may help you choose the program that can grow to meet your specific needs.

Understanding software add-ons

Unlike expanding a Mac, expanding a publishing program involves no expansion slots or static-sensitive circuit boards. To install a utility, simply copy it to a folder on your hard disk. Depending on the complexity and quantity of the add-ons you're using, you may also need to use the Finder's Get Info command to increase the amount of memory allocated to the publishing program (see Chapter 23). When you start the publishing program, it examines that folder and loads the add-ons it finds. The add-ons' names appear in one or more of the program's menus.

Quark's XTension technology

Beyond these basics, however, the programs' underlying approaches to extensibility diverge. Quark's XTensions technology enables extensions to tap into Quark-XPress' software code. Quark provides dozens of software routines extensions developers use to create dialog boxes and manipulate style sheets, ruler guides, text and picture boxes and their contents, menus — every aspect of Quark-XPress. XTensions can add commands to any QuarkXPress menu, and those commands can be dimmed (made unavailable) when it doesn't make sense to choose them. XTensions can display floating tool palettes that are always available and that operate like QuarkXPress' own palettes. XTensions can weave themselves into QuarkXPress and become part of it.

Because extensions are intimately tied to QuarkXPress, however, compatibility problems often arise when Quark releases a new version of the program. Before buying an extension, verify that it works with your version of QuarkXPress.

Aldus PageMaker additions

Aldus aims to avoid the extension compatibility problem by putting some distance between PageMaker and its add-ons, which are called *additions.* Instead of granting developers access to PageMaker's code, Aldus has created what it calls the interface manager, a middleman that enables additions to interact with PageMaker through two text-based languages. One language comprises commands: Put a ruler guide at the 3-inch vertical mark, create a new tabloid-size document, import a file, and so on. The other language handles queries: What font does the selected text use, where is the rulers' current zero point, and what are the current tracking settings? Both languages are fairly easy to understand because they're derived from PageMaker's menu commands and mouse actions. (See Chapter 25 for more details on scripting languages.)

But the problem with languages — especially computer languages — is that they have finite vocabularies. A PageMaker addition can't make PageMaker do anything that PageMaker doesn't already know how to do. Imagine the Aldus Additions technology as a set of wires leading to a puppet's limbs. Now imagine Quark's XTension technology as not only providing those wires, but also enabling developers to add entirely new limbs.

This isn't to say that additions can't make PageMaker do new things. They can, but they must ultimately rely on the command and query languages to put their efforts on PageMaker's pasteboard.

A more direct limitation of the Aldus Additions technology is that an addition must complete its work before you can return to the publication window. As a result, additions can't provide floating tool palettes that are always available (many such extensions are available for QuarkXPress). Nor does the Additions mechanism enable an addition to appear in any PageMaker menu — all additions appear in the Aldus Additions submenu (in the Options menu). Finally, an addition's name cannot be dimmed when the addition isn't relevant (for example, it wouldn't make sense to choose the Drop Cap addition when you have a graphic selected, and yet the addition is available). This bends Apple's rules for how Mac programs are supposed to work.

But the Additions mechanism also has some advantages over the XTension technology. One is that you can create your own additions by writing scripts in PageMaker's command language. Want to automate a repetitive task? Type a script on PageMaker's pasteboard or in its story editor, and then select the script and choose the Run Script command (see Figure 10-4 "PageMaker on Autopilot"). PageMaker hackers often litter their pasteboards with time-saving scripts that make fractions, apply kerning, shift baselines, reflow text, import files, and much more.

Shopping for add-ons

Many extensions are developed by small software shops that aren't equipped to take orders and ship products. The best source for purchasing extensions is San Francisco-based XChange (800-788-7557, 415-337-0102). The firm also helps put publishing companies wanting customized extensions in touch with freelance extensions programmers. Quark also publishes a detailed extensions directory that's free upon request. A large collection of XTensions is available on on-line services such as CompuServe and America Online.

So who wins the extensibility contest? For sheer numbers, Quark. Whether you want to create complex impositions, track ad placement, customize style sheets, create crossword puzzles, or have QuarkXPress play sounds as you work, there's an

```
new                          --create a new publication
pagesize 8.5, 11             --make it an 8½ by 11 incher, tall
pageoptions off,off          --turn off double-sided, facing pages
pagemargins 1, 1.5, 1, 1     --set page margins
page RM                      --go to right master page
columnguides 2 0.5           --two-column format, half-inch gutter
guidehoriz 1.5               --make ruler guide 1½ in from page top
linestyle thickthin          --use double-rule, thick/thin line style
line (1,1),(7.5,1)           --draw a line across top of page
line (1,10),(7.5,10)         --draw a line across bottom of page
page 1                       --go to first page
autoflow on                  --turn Autoflow on
import "report"              --import file named "report"
place (column 1 left, 1.5)   --place it starting at column 1
page 1                       --return to page one when done
view fit                     --switch to fit-in-window view
```

Figure 10-4: PageMaker on Autopilot This Aldus Additions script shows how you might use scripts to automate the production of a weekly status report. The text following each set of double hyphens are comments that describe each statement's purpose.

extension for the job. The large selection of top-quality extensions makes QuarkXPress the most versatile publishing program available. Many extensions are geared toward high-end pagination and publication management, giving QuarkXPress additional appeal for newspaper and periodical publishing.

Taking the Next Step

If you're committed to making publications look professionally typeset, you may want to investigate the expert sets sold by Adobe and other font vendors. Expert sets include special characters not found in most fonts, including true small capitals, old-style numerals, and fractions (see Figure 10-5 "Expert Characters").

I'll give you more advice on using type in the next chapter. An excellent guide to typographic style is *The Desktop Style Guide*, by James Felici (Bantam, 1991). For general advice on publication design, I recommend *Graphic Design for the Electronic Age*, by Jan V. White (Watson-Guptill Publications, 1988).

When you're starting a new project, don't forget most publishing programs include a library of predesigned templates for common types of publications, including

But NASA's greatest triumph came 2-1/2 years later, with the 1969 launch of Apollo 11.	But NASA's greatest triumph came 2½ years later, with the 1969 launch of Apollo 11.

Figure 10-5: Expert Characters Many font vendors offer expert edition fonts that contain additional characters such as small capitals, fractions, and old-style numerals, which have ascenders and descenders. Adobe's Caslon is shown here. The large capitals (left) overwhelm the surrounding lowercase characters, the phony fraction looks tacky, and the numerals break up the rhythm of the line. Small capitals (right) make acronyms less acrimonious and the true fraction and old-style numerals add a touch of class.

newsletters, brochures, invoices, and books. PageMaker includes an especially attractive template library; the program's manual has tips for modifying the templates to suit your needs.

Perhaps a future generation of publishing programs will have the smarts to handle many design and typographic chores for you. Until then, you must make the same decisions that designers and typesetters have been making for centuries, decisions aimed at one goal — conveying your message in an appropriate, aesthetically pleasing way.

QUICK TIPS

Working Faster in PageMaker and QuarkXPress

Complex documents with lots of graphics and a variety of type styles and sizes can slow down a publishing program. Here are a few tips for speeding up PageMaker and QuarkXPress. Unless otherwise noted, the following tips apply to both programs.

Other ways to speed up these and all programs include increasing their memory allocation using the Finder's Get Info command (see Chapter 23) and, of course, speeding up your Mac with a faster hard disk or accelerator board (see Part III).

Using picture placeholders

If your pages have a lot of graphics on them, you can speed up the screen display by choosing to view picture placeholders instead of the graphics themselves. Scrolling is faster, as is switching between pages and magnification views.

In QuarkXPress, choose General from the Preferences submenu (in the Edit menu) and check the Greek Pictures option. When this option is active,

(continued on the next page)

(continued from the previous page)
QuarkXPress displays a graphic as a gray box; click the gray box to see its actual graphic. In PageMaker, choose Preferences from the File menu. In the Graphics section, choose the Gray Out option.

In PageMaker, you can dramatically speed up printing by choosing to print picture placeholders instead of the actual graphics. This is a real time-saver when you're in the proofing phase of a project. In the Print dialog box, check the Proof box. Each graphic will print as a rectangle with an *X* in it. If you want faster printing but you need to see the graphics, click the Print dialog box's Options button and then choose Low TIFF Resolution from the Graphics pop-up menu. This prints TIFF images at a relatively coarse 72 dots per inch. (For more details on TIFF images and other graphics file formats, see Chapter 13.)

Using text greeking

Displaying a page of text — especially one that uses multiple fonts, sizes, and styles — can slow the Mac at least as much as displaying lots of graphics. To speed up page displays, use the *text greeking* option PageMaker and QuarkXPress provide. When active, text greeking displays each line of text as a gray bar.

Both programs let you specify a greeking threshold — a type size below which all text is greeked. In PageMaker, choose Preferences and click the Options button. In the Text area, type a size in the Greek Text Below box. In QuarkXPress, choose General from the Preferences submenu and type a value in the Greek Below box.

Using PageMaker's story editor to edit text

Publishing programs aren't word processors. Performing extensive text editing in a publication can be cumbersome as you jump from page to page and column to column. PageMaker's unique word processor-like story editor lets you edit without having to weave through a publication's pages. Just triple-click on a block of text to open the story editor window. (Or select the text block and choose Edit Story from the Edit menu.)

The story editor shows text in a single font and size — normally, 12-point Geneva. This can be handy when you're working with tiny type or with a fancy script font that's difficult to read on-screen. You can change the font and size by clicking the Options button in the Preferences dialog box.

Using the quick-drag technique to move items

If you begin dragging immediately after clicking an object, PageMaker and QuarkXPress display an outline indicating the item's size as you drag. However, if you hold down the mouse button for a moment without moving the mouse, both programs display the actual item as you drag. The latter approach lets you see the actual text or graphic as you move it, but it takes longer. (You can see the mouse pointer turn into a wristwatch as the program prepares the display.) When you just want to sling something across a page, use the quick-drag technique: Begin dragging immediately after clicking an object.

Using the on-screen palette for formatting and sizing

Both programs provide floating palettes that, among other things, let you format text, resize text blocks and graphics, and change the position of items on a page. In QuarkXPress, the palette is called the measurements palette; in PageMaker, it's the Control palette. Using this palette is often faster than traveling up to the menu bar, especially if you have a large screen.

Both programs' palettes provide a slick shortcut for changing the size or position of an item: You can change size or position mathematically. For example, say an item is positioned 2 ½ inches from the left margin and you want to move it 3 ¾ inches to the right. Instead of having to calculate the desired position and then type it into the palette, you can simply type **+3.75** in the appropriate box.

PageMaker's Control palette takes this feature one step further by also enabling you to multiply and divide. If you want to double the width of a text block, just type ***2** in the Control palette. PageMaker's Control palette also has numerous keyboard shortcuts for choosing fonts and other options. They're described in the PageMaker manual.

Store often-used items in a library

Both programs provide library features that let you store and recall often-used items — graphics, logos, text blocks, and so on. Take advantage of this feature to store the page elements that you use often.

CHAPTER 10 CONCEPTS AND TERMS

- Some of the techniques you can use to enliven a publication include using a wide instead of tall orientation and adding spot color.
- You can produce pages that are larger than the maximum size your printer accepts by using a publishing program's tiling feature, which splits oversized pages into separate pages that you tape or glue together.
- Using true typographers' quotes as well as em and en dashes adds a professionally typeset look to your document's text.
- You can improve the appearance of justified text by fine-tuning paragraph spacing and by hyphenating.
- PageMaker and QuarkXPress are extensible — you can add new features to either program through the use of small software modules.
- Quark's XTension technology allows for more sophisticated software add-ons than does Aldus' Additions technology, but compatibility problems can arise when a new version of QuarkXPress is released.

discretionary hyphen
Also called a *soft hyphen,* a code you can insert between syllables to tell a publishing program where to divide a word if possible. If reformatting or editing changes the line breaks later, the hyphen disappears but the discretionary hyphen code remains.

em dash
A dash that typographers use instead of double-hyphens to set off part of a sentence (— instead of--).

expert set
A font that includes special characters not found in most fonts, such as true small capitals, old-style numerals, and fractions.

H & J
Short for *hyphenation and justification,* a generic term that refers to a program's hyphenation and text-spacing features. Also, in QuarkXPress, a set of hyphenation and justification settings.

kerning
The process of adjusting the space between certain character pairs, such as *To.*

landscape orientation
Also called *wide orientation,* a page that is wider than it is tall — for example, 11 by 8 ½ inches.

ligature
Connected character pairs such as *fi* and *fl.*

overlay
A separate page containing only the items that will print in a specific color.

Pantone
A popular printing industry system for specifying colors.

portrait orientation
Also called *tall orientation,* a page that is taller than it is wide — for example, 8 ½ by 11 inches.

smart quotes
A software feature that automatically generates typographers' quotes (for example, "these") as you type or import text.

tiling
A publishing program feature that lets you create publications larger than your printer can print by splitting oversized pages into separate pages that you tape or glue together.

tracking
A publishing program feature that automatically adjusts the space between every character. With small sizes, spacing is increased to open up the text and make it less dense. In large sizes, spacing is decreased to tighten up the text.

trim size
The final size of a printed publication.

CHAPTER ELEVEN

Typography

IN THIS CHAPTER

- Introducing the basics of fine typography
- Choosing the right font to complement the message
- Determining the appropriate type size and line length
- Deciding on the appropriate line spacing and text alignment
- Learning to typeset forms and faxes
- Getting a professional take on Macintosh typography

When you use the Mac, you're setting type. When you choose different fonts, sizes, or styles — be it in a publishing program, word processor, spreadsheet, or database — you're making the same decisions typographers have made for centuries. You're specifying the type characteristics that will convey your message clearly and attractively.

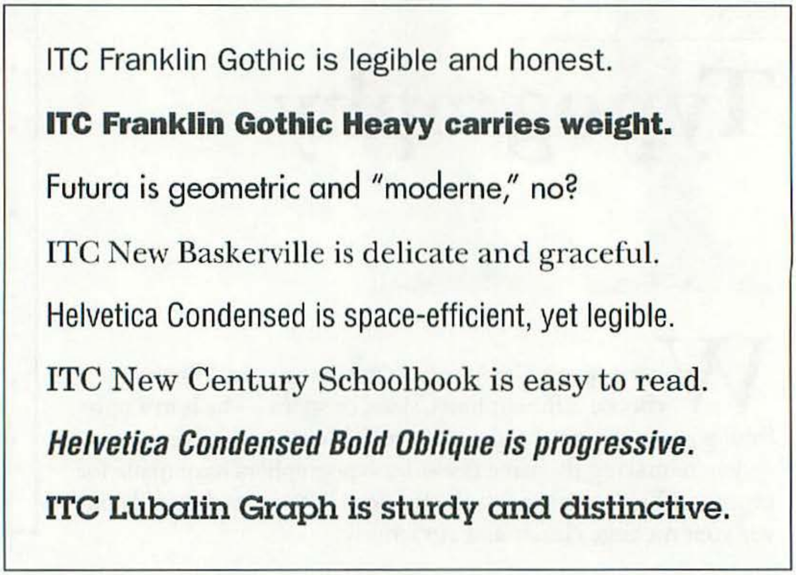
Or are you? Do you choose fonts that are appropriate to your message, or do you flit from font to font because the Mac makes it easy to do so? Do you choose type size, line spacing, and line length with readability in mind, or do you use whatever combination strikes your fancy?

The fact is, fine typography requires training and experience. Because type and fonts play such a large role in the Macintosh world, it's important to understand the basics of typography. In this chapter, I present some techniques for making your documents more readable.

Choosing a Font

A typeface is a unique design of uppercase and lowercase characters, numerals, punctuation marks, and symbols. A *font* is the implementation of a typeface in one size. In the hot metal era, when different molds were required to cast different sizes of type, the distinction between *typeface* and *font* was important. Indeed, the noun *font* is derived from the verb *found* — to pour into a mold in a foundry. Today, the terms *typeface* and *font* are generally used interchangeably.

The most basic typographic choice is usually that of a typeface. Each typeface has a personality; some are sophisticated, some are casual, and others are forceful and bold (see Figure 11-1 "Font Personalities"). Your goal is to choose typefaces whose personality complements your message.



ITC Franklin Gothic is legible and honest.

ITC Franklin Gothic Heavy carries weight.

Futura is geometric and "moderne," no?

ITC New Baskerville is delicate and graceful.

Helvetica Condensed is space-efficient, yet legible.

ITC New Century Schoolbook is easy to read.

Helvetica Condensed Bold Oblique is progressive.

ITC Lubalin Graph is sturdy and distinctive.

Figure 11-1: Font Personalities A sampling of eight Adobe Systems PostScript typefaces shows how the shape and thickness, or weight, of each character contributes to a typeface's overall appearance. Special flourishes such as Futura's flashy question mark and the square serifs in ITC Lubalin Graph also add interesting personality traits.

Although some studies show little difference in legibility between *serif* and *sans serif* fonts, it's generally believed that serif typefaces are more legible and therefore better suited to lengthy text passages. I recommend that typographic newcomers follow this rule of thumb: Better serif than sorry.

Another issue concerns whether to use the same font for all the elements of a document, or to use a different font for headings and subheadings. One way to get good results is to use different fonts within the same family. For example, you may use Garamond for body type (or body text), Garamond Bold for headlines, and Garamond Italic for captions. Or you can mix typefaces by using, for example, New Baskerville for body text and Helvetica Black for headlines. Just be consistent throughout a document, and don't mix with abandon.

Condensing your copy when space is tight

The amount of copy you have may also influence your choice of typeface. To squeeze a lot of text into a small space, consider a space-efficient *condensed* typeface. The downloadable font libraries from Adobe Systems, Bitstream, Compugraphic, and other font vendors include attractive condensed versions of typefaces such as Helvetica, Univers, and Futura. A large selection of free or inexpensive, high-quality downloadable fonts is also available through user group libraries and on-line services and from software clearinghouses such as Educorp.

Line Length and Type Size

After choosing a font, you need to settle on the width of text columns and the type size. Both decisions are related and have one goal — putting a manageable number of words on each line.

Two rules of thumb exist for determining line length. One states that each line should have roughly 8 to 11 words. Another says that a column should be just wide enough to accommodate 2½ lowercase alphabets in the typeface and size you plan to use (see Figure 11-2 "How Long a Line?"). Experimentation with both rules reveals that they often provide the same results. The bottom line: Strive for lines containing between 50 and 70 characters.

Most people read groups of three or four words at a time rather than individual words. If there are too many words on each line, the eyes tire as they journey from left to right. Too few words on each line, and the flow of the text becomes disrupted by line breaks and excessive hyphenation.

Deciding on a type size

Your choice of type size will be influenced by the amount of text you have and the space into which it must fit. For documents duplicated on a laser printer or photocopier, you probably won't have a preconceived number of pages, or a page count, in mind. If that's the case, simply choose a type size that works with your column width to provide from 8 to 11 words per line.

For a document that will be commercially printed, however, you must determine the page count in advance to make sure your text fits within it. Before WYSIWYG (what-you-see-is-what-you-get) screen displays, designers and typographers endured a complex *copyfitting* routine that involved crunching through formulas to calculate character widths. Today's WYSIWYG programs and displays let you adjust the type size as you work. Of course, on-the-fly tweaking is effective only to a point. In a newsletter, for example, you wouldn't adjust each article's type size

abcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefghijklm

One rule of thumb for determining line length states that a line should be wide enough to accommodate 2.5 lowercase alphabets in the typeface and size you plan to use. This works out to roughly 8 to 11 words per line — not so many that the eye gets lost, but enough to retain the smooth flow of the text.

Figure 11-2: How Long a Line? One way to determine the ideal line length for a given font and size is to type 2½ lowercase alphabets, as demonstrated here in 10-point Optima.

to accommodate its text. That would destroy the publication's uniformity, and uniformity is a cornerstone of good typography and design. When an article is a tad long, try hyphenating more lines (this works best with text that's set ragged right). If it's still too long, consider cutting some text.

When an article is too short, try removing hyphenations, breaking long paragraphs into shorter ones, or narrowing the width of the columns. If these techniques fail, consider filling the leftover space with a graphic element such as a straight line (or rule) or an ornamental dingbat. Other possibilities include lengthening the article by using *subheads* or *pull quotes.* Or you can leave the space blank. Just as silence is an integral part of music, white space is an integral part of graphic design.

Leading Guidelines

Another way to do your readers a favor is through appropriate use of line spacing, or *leading.* For body text, the general rule is to lead at 20 percent of the type size. For 10-point type, for example, use 2 points of lead for a total of 12 points from one base line to the next. The Mac's fonts contain built-in autoleading specifications that use this 20 percent rule. When you specify "auto" in your word processor or desktop publishing program, the program uses the font's autoleading value.

Leading to not see double

The 20 percent rule is a good starting place, but many other factors should influence your choice of leading. Line length is one. With long lines, too little leading causes readers to occasionally read the same line twice, a phenomenon known as *doubling.* Longer lines benefit from more leading.

Type size should also influence how much leading you use. Headline type (14-point or larger) generally needs more leading than body type (8- to 12-point). Type that's smaller than 8-point sometimes needs more than 20 percent leading to make the tiny type appear less dense.

Use less leading for headlines

The rule, "Large type requires more leading," doesn't always apply to headlines. Headlines often look better when set solid — with no extra space. (For example, a 24-point headline set solid has 24 points of space between base lines.) With some fonts, you may even consider *minus line spacing,* such as 22-point leading with 24-point type. Just watch that one line's *descenders* don't touch the next line's *ascenders.*

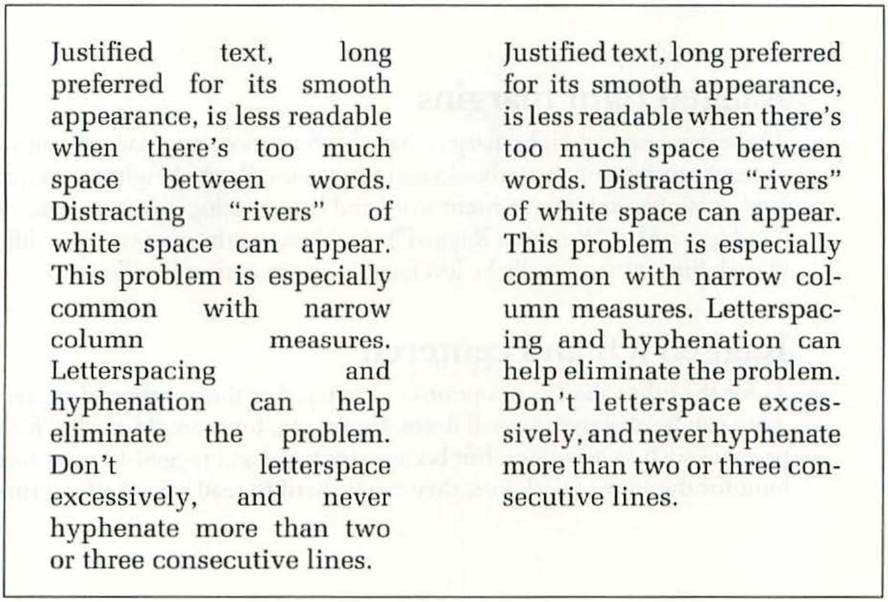
When specifying type size and leading, designers write a kind of fraction in which the type size is the numerator and the leading is the denominator. For example, 10-point type and 12 points of leading from base line to base line is specified as $^{10}/_{12}$, and pronounced "ten on twelve" or "ten over twelve."

Understanding Alignment Issues

Another major aspect of type formatting concerns the alignment of the left and right margins. You're probably familiar with the three most common forms of alignment: flush left, ragged right; justified; and flush right, ragged left. But which to use, and when?

Traditionally, large passages of text have been set justified. Many designers believe that neatly aligned left and right margins are best suited to sustained reading because they give pages a quiet look that lets readers concentrate on content.

To justify text, word processors add space between each word. Some desktop publishing programs, including Aldus PageMaker and QuarkXPress, can also add space between each character, a process called *letterspacing*. Letterspacing helps eliminate the large word spaces and the rivers of white space that can occur (see Figure 11-3 "Justifying Your Actions"). Hyphenation also helps, although you should never hyphenate more than two or three consecutive lines.



Justified text, long preferred for its smooth appearance, is less readable when there's too much space between words. Distracting "rivers" of white space can appear. This problem is especially common with narrow column measures. Letterspacing and hyphenation can help eliminate the problem. Don't letterspace excessively, and never hyphenate more than two or three consecutive lines.

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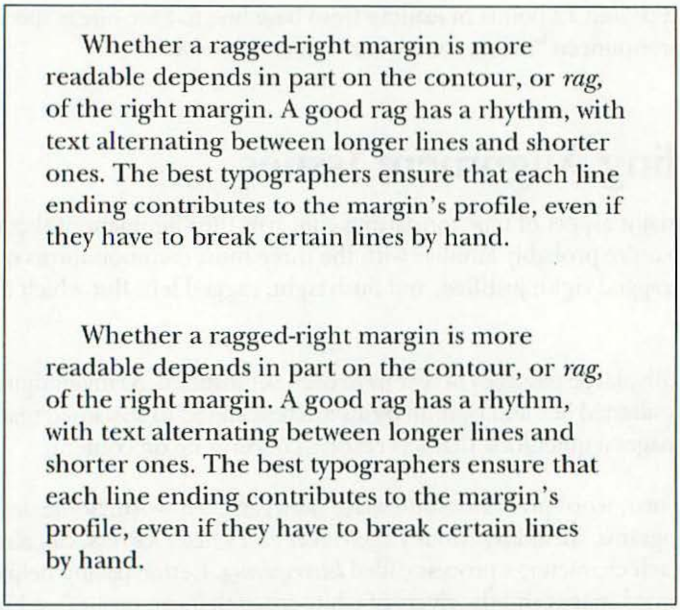
Figure 11-3: Justifying Your Actions Appropriate use of letterspacing and hyphenation can dramatically improve the appearance of justified type. Also note that because more text can fit on each line, the same amount of copy takes up less space. Adobe's Melior typeface is used here.



Whether a ragged-right margin is more
readable depends in part on the contour, or *rag*,
of the right margin. A good rag has a rhythm, with
text alternating between longer lines and shorter
ones. The best typographers ensure that each line
ending contributes to the margin's profile, even if
they have to break certain lines by hand.

Whether a ragged-right margin is more
readable depends in part on the contour, or *rag*,
of the right margin. A good rag has a rhythm,
with text alternating between longer lines and
shorter ones. The best typographers ensure that
each line ending contributes to the margin's
profile, even if they have to break certain lines
by hand.

Figure 11-4: Running Ragged In the top paragraph, notice how most lines hover around the same width, making the right margin look poorly justified, not ragged. When the word *with* is brought down to the next line in the bottom paragraph, the right margin assumes a more ragged contour. This example uses ITC New Baskerville.

Ragged right margins

These days, ragged-right margins have become more popular, even in such bastions of justification as textbooks and magazines. Ragged-right text requires fewer hyphenations, and its consistent word and letterspacing give it a clean, even texture (see Figure 11-4 "Running Ragged"). And because the eyes stop at a different point in each line, it can actually be less fatiguing to read than justified text.

Ragged left and centered

As for the other alignment options — centered or flush-right and ragged left — both can be effective in small doses. Centering, for example, is ideal for short passages such as headlines. But because centered and ragged-left text force you to hunt for the start of each line, they can be hard to read over the long run.

Type on Display

Headlines and other large, attention-getting blocks of type are called *display type.* Showing attention to detail in display type is an important step in making documents look professionally typeset.

With display type intended to grab the reader's interest, you may be tempted to use all capital letters for added oomph. Resist the urge. A mix of upper- and lowercase characters gives words an overall shape that aids in recognition; text set in all caps lacks these patterns. It's generally better to capitalize only the first letter of important words, leaving conjunctions and articles such as *and*, *in*, and *the* lowercase. That way you won't put undue emphasis on less important words.

Kerning for better spacing

After you settle on case, concentrate on the space between characters and words. As I mentioned in the last chapter, most fonts produce too much space between certain character pairs, especially in large type sizes. You can improve the look by tightening those spaced-out pairs, a process called *kerning.*

In smaller type sizes, kerning usually involves tightening only certain letter pairs, such as To or Av. But in large sizes, almost every combination of characters is a candidate (see Figure 11-5 "Kerned Versus Unkerned"). Use the manual-kerning features in your desktop publishing program or word processor to remove space between characters until they are tight, but not touching. Also decrease the spaces between words. Just be sure to apply the same degree of kerning and word spacing throughout a document. Inconsistent spacing is worse than none at all.

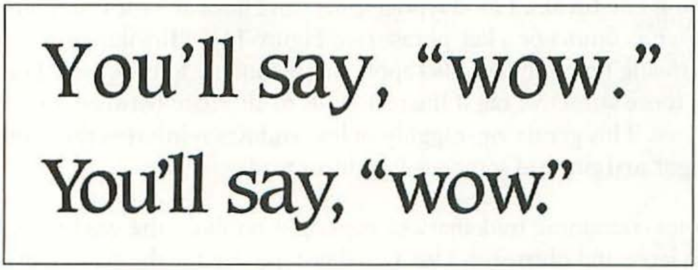

You'll say, "wow."
You'll say, "wow."

Figure 11-5: Kerned Versus Unkerned In display type, nearly every character is a candidate for kerning. Here, space was removed between the *Y* and the *o,* around the apostrophe, between the *y* and the comma, between each *w,* and between the period and the closing quotes. A little less space was removed between the *a* and the *y.* Notice how the kerned headline uses less space. This headline was created with Letraset's LetraStudio display-type program, which simplifies manual kerning tasks by enabling you to position individual characters by dragging them.

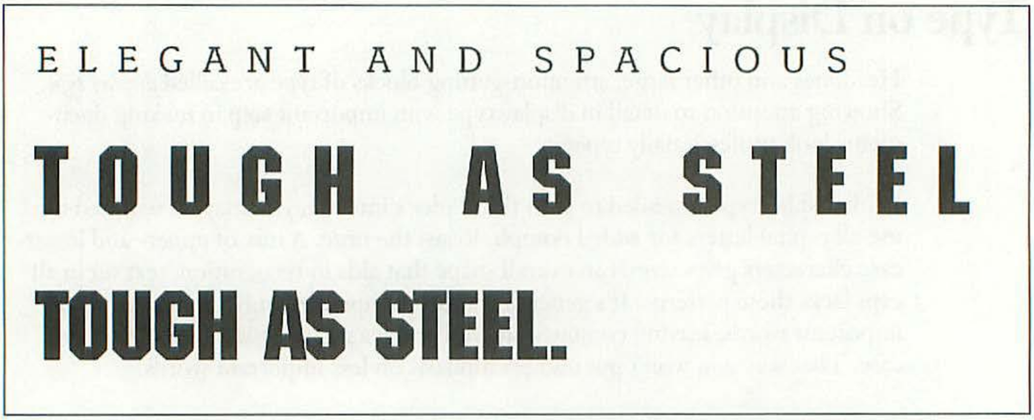
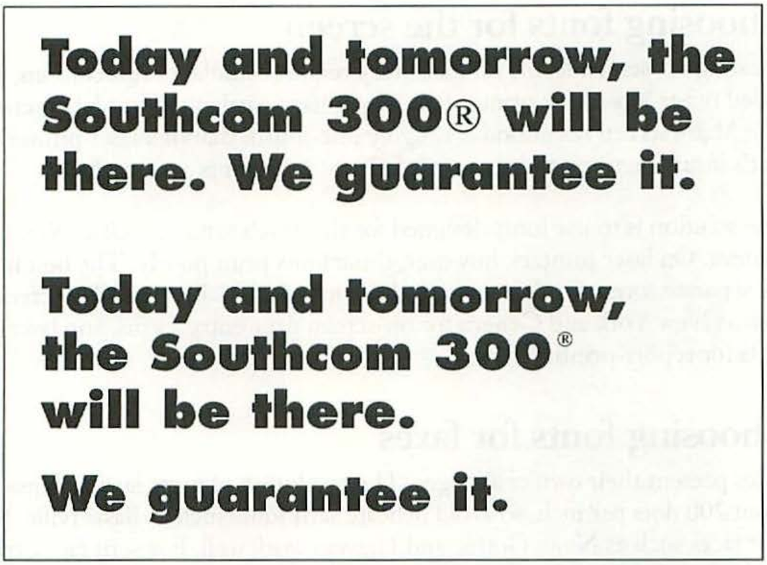


Figure 11-6: Headline Spacing Letterspaced headlines like the one at the top can create an airy, dignified effect, especially if you use a typeface with such elegant capitals as Italia's. Extra space between words keeps them from running together. Heavy, condensed faces such as ITC Machine don't letterspace well and are best set tight. Note the kissing *T* and *O*, *A* and *S*, and *S* and *T*. In the bottom headline, the word spaces were tightened slightly, too. A period gives the slogan added authority.

A variation on the letter spacing theme in headlines involves adding space between each character to obtain an airy, elegant effect. This letterspacing technique can be effective when used sparingly. Be sure to also add more space between words so they don't run together, and avoid letterspacing heavy, condensed typefaces such as ITC Machine. Type set in Machine actually looks better when certain characters touch slightly, or kiss (see Figure 11-6 "Headline Spacing").

With body text, you usually let your word processor or publishing program end each line for you. With display type, however, you should take a more active role in determining line breaks. Good typographers end lines at logical stopping points, such as after a comma or a key phrase (see Figure 11-7 "Breaking for Sense"). The best advertising typographers also apply this technique to body text. For body text, you get a more attractive rag if the text tends to alternate between long lines and shorter ones. This gentle zig-zagging of line endings reinforces the notion of a ragged right margin, and some say it reduces reader fatigue.

In headlines containing trademark or copyright symbols, the symbols are usually much too large and obtrusive. Use a smaller type size for the symbol itself, and then move the symbol so that its top aligns with the top of the text (see Figure 11-7 "Breaking for Sense").



Today and tomorrow, the
Southcom 300® will be
there. We guarantee it.

Today and tomorrow,
the Southcom 300®
will be there.

We guarantee it.

Figure 11-7: Breaking for Sense Readability of display type (here 18-point Futura Extra Bold) is improved by breaking each line at a logical stopping point. Extra leading before the final sentence adds emphasis. This example also shows how to deal with a large, distracting register mark: Select it, and then choose a smaller type size (in this case, 8-point), and then move it until its top aligns with the top of the text.

Forms and Faxes

One document that imposes unique typographic requirements is the form. Forms range in size and style from reply cards, with their blank lines for name and address, to tax forms, with their dozens of cubbyholes and instructions. If you use a database manager, you probably use on-screen forms to enter and view data.

A form's primary purpose is to obtain and present information in a structured format. The first step in creating that sense of order is to select clean, readable typefaces. Sans serif fonts such as Helvetica and News Gothic are particularly well suited to forms (just ask the IRS). Univers is another sans serif font that works well in forms.

When designing forms, group related information together. If the form will be filled out by hand, leave enough space for people to write comfortably. Put 18 to 24 points of space between each line, and make lines long enough to accommodate long names and addresses.

Choosing fonts for the screen

Creating on-screen forms for data entry requires similar considerations, with an added twist: Most laser printer fonts don't have particularly readable screen fonts. The Mac's screen resolution is roughly one-fourth that of a laser printer's, and that's insufficient to render the subtleties of most fonts accurately.

One solution is to use fonts designed for the Mac's screen, such as New York and Geneva. On laser printers, however, these fonts print poorly. The best method is to use separate forms for data entry and report printing. Use readable screen fonts such as New York and Geneva for on-screen data-entry forms, and laser-printer fonts for report-printing forms.

Choosing fonts for faxes

Faxes present their own challenges. The resolution of most fax machines is only about 200 dots per inch, so avoid delicate serif fonts such as Baskerville. Sturdy, sanserif faces such as News Gothic and Univers work well. For serif faces, try Lucida or ITC Stone Informal. Avoid type sizes smaller than 9 point. Also avoid placing page numbers and the like at the very bottom of the page — your faxes will take longer to send.

Character Cautions

One of the easiest ways to make documents look typeset is to replace the Mac's typewriter-like punctuation characters with characters typesetters use (see the Quick Tips box "Type Tips" as well as the quick reference card in the front of this book).

Avoid gimmicky font styles such as shadow and outline. And avoid superimposing type over a gray-shaded background. Type is most legible when it's easily distinguished from the background; black-on-gray isn't exactly a high-contrast combination.

Also think twice about using the small-caps option that many programs provide. To create small caps, typesetting systems provide special fonts in which the small capitals are drawn to match the texture and line thickness of the large capitals. On the Mac, programs with small-caps options simply use a smaller type size for the small capitals. The resulting small caps have lighter *stem weights* than the large ones, giving the text an uneven appearance. Similarly, in *derived fractions* — ones made up of small inferior and superior characters with a slash sandwiched between them — the tiny numerals have such light stem weights that they often don't print well.

Type Tips

I acquired an appreciation for fine typography while working for Davis & Warde, a 100-year-old printing company in Pittsburgh, where I learned the trade from old-school masters who wore visors and referred to text as "matter." Headline matter, body matter, it didn't matter — no job was too complex. There an apprentice typographer started out melting down old type into lead bars, and loading and unloading 75-pound font "magazines" into Linotype machines. After six years, he (rarely she, in those days) became a journeyman.

"You learned your trade through association with experienced people," said Bill Darney, who started as an apprentice in 1959, and then graduated to shop foreman and later, vice president. "There were shop standards for aesthetics and consistency you had to learn and live by — or die. Those standards are exactly what's lacking today. When you have so many people creating type in so many ways, [standards and consistency] fall by the wayside."

The death of hot-metal type forced Davis & Warde to make the painful transition to "cold" type — big phototypesetting machines, later to be supplemented by Macs. They succeeded, partly because they knew the basics of quality typography that transcend technology. Here are some ways to follow that tradition on the Mac.

Use em and en dashes

Use these instead of double hyphens. To get an em dash (—) on the Mac, press Option-Shift-hyphen; for an en dash (–), press Option-hyphen. An en dash is used to express a range, standing for *to* between numbers or words.

Use true quotes

Press Option-] and Shift-Option-] for open and close single quotes; for double quotes, press Option-[and Shift-Option-[. (Also, put commas and periods inside quotation marks; colons and semicolons go outside quotes.) Most word processors offer a smart quotes option that inserts the proper quotes as you type. As you read in the previous chapter, desktop publishing programs also offer a quote-conversion option that causes the program to automatically convert quotes when you import word processing files.

Don't put two spaces after punctuation

I know, your high-school typing teacher taught you otherwise. Things are different now. Put only one space after periods, colons, and semicolons.

Don't use a lowercase l for the numeral 1

Though similar on a typewriter, they look different in typographic fonts. And because the l is narrower than the 1 in most fonts, using the l misaligns number columns in tables. The same rules apply to the letter O and the numeral 0.

Hyphenate judiciously

Make sure words break correctly between syllables. Try not to end more than two or three consecutive lines with hyphens, and avoid two-letter divisions (on-ly, un-til). Double-check the results of your program's automatic hyphenation against a dictionary — some words are spelled the same but hyphenated differently (for example, *pro-ject* the verb and *proj-ect* the noun).

Shrink those symbols

The register mark (®) and trademark symbol (™) in Macintosh fonts are far too big. (Maybe they were created by Apple's legal department.) Shrink them down by several sizes and then shift them vertically so that their tops align with the top of the text. Ditto for bullets — if the artillery-sized ones the Mac gives you overwhelm the text they're supposed to accent, shrink them. But remember to move them up so that they're vertically centered within the line.

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Hang that punctuation

When a line begins with an opening quote symbol ("), typesetters often adjust the left margin so that the quote "hangs" outside of it, thus avoiding little pockets of white space that disrupt the margin's perfect edge. Some typographers also hang hyphens outside the right margin in justified text. A typographer named Johann Gutenberg started that tradition in 1455. And when closing quotes (") follow a comma or period, many typographers hang them directly over the comma or period — if the client wants it. At a type house where I once worked, we had to reset an entire university course catalog because the hanging closing quotes weren't stylistically correct.

Align runover lines in bulleted or numbered lists

When you format a series of paragraphs that begin with a bullet character or a number, you're likely to have runover text — text that continues on to subsequent lines. Generally, it's a good idea to indent these runover lines so that they align with the first character that follows the bullet or number.

This sets the list apart from the rest of the body text. And never type multiple spaces to align runover lines (or anything else). Use tabs or adjust the margin to create a hanging indent.

Proofread early and often

Don't wait until you've poured text into a layout to proofread it for the first time. Use your word processor to print it out in double-spaced Courier, and look for misspellings. Then switch to a proportionally spaced font such as Times and tweak dashes, quotes, and other special characters. (Dashes are difficult to discern in Courier.) If you make edits after you lay out the text, be sure to type true quotes and dashes. And as the page comes together, manually kern the type, break for sense, hang punctuation, and sweat all the other little details.

The answer? True-cut small caps and fractions. More and more font developers are offering fonts containing small caps and fractions whose stem weights are designed to match the rest of the typeface. Several of Adobe's fonts, for example, have optional expert sets that include true small caps, a variety of ready-made fractions, and separate numerals that were born to be numerators or denominators.

These collections often include other mainstays of fine typography, such as old-style numerals (ones with descenders and ascenders) and ligatures (connected character pairs, such as fi and fl). They aren't cheap (Adobe's expert sets retail for $275), but they're an essential part of a desktop typographer's toolbox. Fraction fonts are also available on many on-line services; in the next chapter, I show you how to use a font-editing program to create fonts containing fractions.

If you commit to buying true small caps, don't relegate them to headlines or special applications. Use them in body text where appropriate — for acronyms (such as NASA or CIA), for the chronological designations A.M., P.M., B.C., and A.D., and in other instances where large capitals would overwhelm surrounding lowercase text.

BACKGROUNDER

Profile: Making the Desktop Transition

Established in 1976, Type Gallery is the largest type house in Seattle and one of the largest on the west coast. Within the past few years, it has seen its traditional typesetting business decrease at the hands of desktop publishing. Like many type shops, it has taken up the slack by diversifying. In addition to having a bustling desktop publishing department that currently accounts for 20 percent of its business, Type Gallery offers slide-making and color separation services.

The diversification trend is industry-wide, according to owner and president Betty Handly, also a former president of the Typographers International Association, a trade group. "Every typesetter is looking to replace [lost typesetting revenue] with desktop publishing or prepress services," she says. "Some are offering design services. Many of us have invested in printing. But the main trend is color separating. Everybody's a typesetter, now we can all be color separators."

But Type Gallery has also succeeded in selling its typographic expertise to its desktop publishing clients by offering proofreading and kerning services. "The average service bureau's only job is to imageset a file," Handly explains. "Typographers are service-oriented. We're used to interacting with our clients. If we see something wrong with the file, we phone. And if they want us to, we'll go in and fix it."

Quality-minded clients appreciate Type Gallery's extra services, not only because it improves the end product, but because it frees them from the typographic grunt work. "Studios don't want designers doing all the production," Handly says. "At a certain point it becomes more economical to have a typographer do it."

Another selling point is Type Gallery's library of thousands of typefaces. "I don't see people ever buying as many fonts as we carry in our library," asserts Handly. But at the same time, she bemoans the way some inexperienced publishers mix and match typefaces with abandon. "Some people think 'the more typefaces, the better it looks,'" she says.

Poor proofreading is another problem. "People will have just about anybody — a receptionist or an account executive — proofread a job," she says. "Yet next to finding a good typographer, a proofreader is the hardest thing in the world to find."

Handly feels her firms' future lies in its diverse range of services and in its typographic expertise. "Typesetters are very resilient people," she says. "We've been through a lot of technological changes, but as a result, we've become a fairly hearty bunch. I don't feel like I'm in the same business that I was in when I first started. But I'm still in business."

One more word about fractions: If you can't justify buying a fraction font, do create derived fractions instead of using full-sized figures (as in 1 1/2). A derived fraction is better than no fraction at all.

Truth in Italics and Bolds

Another subtle point to be aware of is the difference between true italic text and derived italics, or oblique, text. In most typefaces, especially serif faces, italics are specially drawn to have their own script-like characteristics and to complement the stroke width of the roman version of the face.

The Mac can electronically slant the upright, or roman, version of a font to create a kind of pseudo italic. To see an example, type some text in a font such as Geneva, Chicago, or New York, and then choose the italic style. Illustration programs such as Aldus FreeHand and Adobe Illustrator also let you create oblique text by slanting a block of roman text to an angle you specify.

Oblique text can be a useful design element for headlines and other special purposes, but for body text, you generally want to use the font designer's true italics. In most cases, that's easy — simply install the italic versions of the font's screen and printer fonts. But some font packages don't always include true italics. Adobe's ITC Benguiat package, for example, includes only roman and bold versions, even though Benguiat has beautiful italics. In this case, the solution is to buy from Bitstream, which sells a complete version of the typeface.

The true-versus-derived issue applies to bold text, too, although generally you encounter derived bolds on the Mac's screen more often than in hard copy, and then only when you fail to install the actual bold screen or TrueType font that accompanies a typeface package.

BACKGROUNDER

Profile: Fine Type on a Large Scale

To call Pastore, DePamphilis, and Rampone a big type house is to make a big understatement. Founded in 1976, PDR employs 120 people and has annual billings of over $10 million, 20 percent of which is high-quality desktop publishing work for New York City's top ad agencies and Fortune 100 corporations.

Like other typographers, PDR is diversifying into color. But it's doing so on a scale few others could — by installing an all-digital Heidelberg four-color press, which enables PDR to take a document from a Macintosh or its dedicated equipment and image all four plates directly onto the press' cylinders in 14 minutes with no film and no chemicals. There are only a few presses like it in the world.

The foray into digital color was a logical progression of PDR's desktop publishing work, according to partner Bert DePamphilis. "Since we started our desktop section, we've been into four-color," he

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explains. "We do a lot of annual reports, and we'd been doing all the separations on the flat color — bar charts, pie charts, things like that. So it's a natural step up that we deliver all the color — to do the chairman of the board's face as well as the pie chart that sits next to him."

PDR uses QuarkXPress for page layout and Adobe Photoshop for Mac-based image processing. For creating custom fonts to supplement its full Adobe, Bitstream, Monotype, and Linotype libraries, PDR uses URW's Ikarus-M system and Altsys' Fontographer (covered in the next chapter).

But PDR is far from putting its dedicated Autologic and Bedford systems out to pasture. DePamphilis says, "The Mac is a big bottleneck when you're a high-volume shop. It would take ten Macs to match [the speed of] one of our dedicated systems. But on our dedicated systems we have no graphics capability."

All this Mac enthusiasm is tempered, however, by the abuses of fine typography the firm often sees in desktop published materials. "So many people are taking desktop publishing and ruining the finely tailored look of beautiful typography," laments partner Joseph Pastore. "Somebody ought to start a campaign to stop the abuse of quality typography and the acceptance of it. The fine designers and high-level creative people all feel there's so much garbage being set."

Bert DePamphilis agrees. He believes most publishing programs have adequate typographic features, but "to access them, you need an expert on the program. As usual, it's the person you have behind the program that makes that program sing or not sing."

Recommended Reading

If you're interested in learning more about typography, you may want to investigate the following books: *Designing with Type*, by James Craig (Watson-Guptill Publications, 1971); *Graphic Design for the Electronic Age*, by Jan White (Watson-Guptill Publications, 1988); *Basic Typography*, by John R. Biggs (Watson-Guptill Publications, 1968); *Design Principles for Desktop Publishers*, by Tom Lichty (Scott, Foresman and Company, 1989); *The Mac Is Not a Typewriter*, by Robin Williams (Peachpit Press, 1990); *Stop Stealing Sheep: And Find Out How Type Works* (Adobe Press, 1993); and *The Elements of Typographic Style* (Hartley & Marks, 1992).

Two more excellent sources of type tips are Adobe's *Font & Function* catalog ($6 from Adobe Systems, 1585 Charleston Road, P.O. Box 7900, Mountain View, CA 94039), and the International Typeface Corporation's free quarterly, *U&lc* (write to U&lc Subscription Department, International Typeface Corporation, 2 Hammarskjold Plaza, New York, NY 10017).

As you create and format documents, remember that the best typography is always appropriate to the message it conveys. Every formatting command you issue should be aimed at improving your document's readability. Aaron Burns, chairman of the International Typeface Corporation, sums it up best: "In typography, function is of major importance; form is secondary; and fashion, almost meaningless."

CHAPTER 11 CONCEPTS AND TERMS

- Fonts and type play large roles in the Mac world, making an awareness of typographic basics important.
- The first step in choosing a font involves deciding between sans-serif and serif designs.
- To arrive at the ideal line length, strive for an average of about 8 to 11 words per line.
- Body text generally looks best when you choose a program's autoleading option. Consider setting headlines with no extra leading.
- Justified body text can be prone to rivers of white space, which can be eliminated with judicious hyphenation and letterspacing.
- In display type, almost every character combination can benefit from some kerning.
- For professional looking fractions, small capitals, and old-style numerals, use an expert set version of a font.

ascender
The part of characters such as f or d that rises above the body of the letter.

base line
The imaginary line on which the body of a character sits. Leading is measured from base line to base line.

body type, or body text
The typeface used for the main text of a job.

descender
The portion of characters such as j or g that drops below the base line.

dingbat
Also called an *ornament,* a decorative graphic element.

downloadable font
A font stored on a floppy or hard disk and downloaded into a laser printer's memory before use.

drop cap
A decorative capital at the beginning of a paragraph set in a larger size than the surrounding body text and lowered to occupy more than one line.

em space
A fixed amount of space equal to the point size of the typeface you're using. In 12-point type, an em space is 12 points wide.

en space
Also called a *nut space,* a fixed amount of space equal to half an em space.

family
A group of related typefaces. For example, Times Roman, Times Italic, Times Bold, and Times Bold Italic are all members of the Times family.

font
All the characters for one typeface, and historically, in one size. Today, *font* and *typeface* are often used interchangeably.

hanging punctuation
Positioning punctuation outside the even left or right margin of text for better visual alignment. Also the technique of hanging quote symbols over a period or comma to tighten up the text.

leading
The amount of space between two base lines (pronounced led-ing).

letterspacing
Adding space between letters to create an airy effect in a headline or to justify body text.

ligature
Two or more connected characters, such as fi or fl.

old-style numerals
Numerals with ascenders and descenders, often used in body type for better legibility.

pica
A unit of measurement that is equal to 12 points.

point
A unit of measurement equal to .01384, or approximately 1/72, inch. The point size of a given typeface is the distance between the top of the highest ascender and the bottom of the lowest descender.

pull quote
A phrase extracted from the body text and set in large type to attract the reader's attention.

rag
An uneven left or, more often, right margin.

sans serif
A typeface without serifs. Sans-serif typefaces include Helvetica, Futura, and the Mac's Geneva screen font.

serif
A line crossing the main strokes of a character. Serifs lead the eye across a line of type. Serif typefaces include Times, Palatino, Century Schoolbook, and the Mac's New York screen font.

small caps
Capital letters with the same height as the lowercase characters.

subhead
A heading within the text that's used to split up lengthy passages and draw the reader's attention.

thin space
A fixed amount of space equal to half an en space.

tracking
Also called *track kerning,* uniformly adjusting letter and word spacing over a range of text. Track kerning generally adds space between characters in very small sizes and decreases space between text in large sizes.

x-height
The height of a typeface's lowercase letters, excluding ascenders and descenders.

CHAPTER TWELVE

Font Customizing Tips and Techniques

IN THIS CHAPTER

- Understanding the differences between bitmap and outline fonts
- Making a new font from an existing one
- Creating fractions and other special characters
- Customizing with Adobe's Multiple Masters

The Mac's ability to set type in a variety of fonts, sizes, and styles has always been the cornerstone of its personality. The Mac's typographic features have improved dramatically in recent years, as *outline* fonts have become the dominant font technology in the Macintosh world.

In this chapter, I show how to perform several font-customizing jobs using several top font programs. You'll need to know how to install fonts in your system; instructions are included in Chapter 23.

Font Basics

In an *outline* font, characters are described by mathematical equations; by processing these equations, the Mac can create characters of virtually any size — as if characters were created using rubber bands that can be stretched and resized.

The other major approach to describing fonts — the *bitmap* approach — isn't nearly as efficient or flexible. In a bitmap, or *fixed-size* font, characters are described by an arrangement of bits — it's like building a character by arranging a kid's wooden blocks. A separate arrangement of bits is needed for each size; most bitmap fonts include descriptions for the common type sizes: 10, 12, 14, 18, and 24 point. If you specify a point size for which no arrangement exists, the Mac *scales* an existing size to fit, resulting in misshapen, chunky-looking characters.

Outline font flexibility

Instead of restricting you to specific sizes, outline fonts enable you to format text in any size: 29 point, 17.5 point, 589 point, and so on. This makes it easy to fit headlines into a specific width and it simplifies copy fitting, the previously arduous task of choosing the point size that enables a certain amount of text to fit in a certain amount of space.

Two outline font technologies are prevalent in the Mac world today: PostScript fonts are the veterans and TrueType fonts are relative newcomers. PostScript printers such as Apple's LaserWriter Pro 600 and 630 contain a selection of PostScript font outlines; you can supplement these *resident* fonts with *downloadable* fonts, which live on your Mac's hard drive and are transferred to the printer's memory during a print job.

The most common and preferable format for PostScript downloadable fonts is Type 1; Type 3 is a less common format that generally delivers inferior results on laser printers. If you use the Adobe Type Manager utility (ATM), you can print Type 1 PostScript fonts on non-PostScript printers such as Apple's StyleWriter II or LaserWriter Select 300.

Customizing and special effects

Because outline fonts are as flexible as rubber bands, they're naturals for special typographic effects. By stretching a font vertically, you can create a skinnier, *condensed* version of the original typeface. Stretching the font horizontally gives you a wider, *expanded* font. You can attach an outline font to a curved line to create wavy-looking text, or stretch it to fit an irregular shape. You can even alter the characters themselves to create logos, special symbols, and fractions.

QUICK TIPS

Font Customizing: The Legal Angle

There are some legal issues behind font customizing. Specifically, you can't legally modify an existing commercial font (or use it to create fractions) and then distribute the resulting font or post it on an online information service — even if you change the font's name. Doing so is as much a form of software piracy as copying a word processor for a friend.

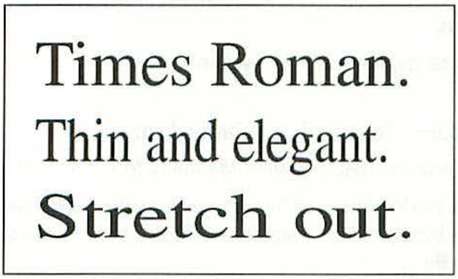
Numerous programs are available that let you perform these and many other font-customizing jobs. Altsys' Fontographer and Letraset's FontStudio let you alter fonts and create new ones from scratch. Ares' FontMonger, Type Solutions' Incubator Pro, Design Science's ParaFont, and Altsys' Metamorphosis Professional are best suited to modifying existing fonts — converting them from one outline format to another, expanding or condensing them, or creating fractions.

Then there are type effects programs such as Letraset's LetraStudio and Brøderbund's TypeStyler, both of which let you twist, stretch, squeeze, mold, mirror, and otherwise modify type. LetraStudio and TypeStyler excel at display type — fancy headlines, product labels, and logos. They let you do with a mouse what used to require hours of labor over a layout table or in a darkroom.

Expand and Condense

Expanding or condensing, or *horizontally scaling*, a typeface can give it a new, distinctive personality. This point isn't lost on Apple — its corporate font is a condensed version of Garamond. A condensed font looks more delicate and allows more text to fit on a page; an expanded font has a weightier look (see Figure 12-1 "Expanding and Condensing").

The Aldus PageMaker and QuarkXPress publishing programs let you expand or condense text formatted in existing fonts; drawing programs such as Aldus FreeHand and Adobe Illustrator can also do this. But wouldn't it be more convenient to have fonts that are expanded or condensed to begin with? That way, you could use them in programs that don't have horizontal scaling commands, such as word pro-



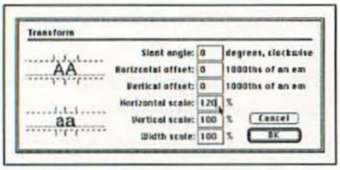
Times Roman.
Thin and elegant.
Stretch out.

Figure 12-1: Expanding and Condensing
Expanding or condensing a font can give it a new personality. The original Times Roman (top), condensed 20 percent (middle), and expanded 30 percent (bottom) present three different faces.

cessors. You can scale fonts in advanced programs like Fontographer, but it's often easier in the basic (and more economical) font-customizing programs. To learn how to scale fonts in Incubator Pro or ParaFont, see the Step-by-Step box, "Scaling Fonts."

Scaling Fonts

Expanding or condensing, or horizontally scaling, a typeface can give it a new, distinctive personality. These instructions show you how to scale a font using ParaFont and Incubator Pro.

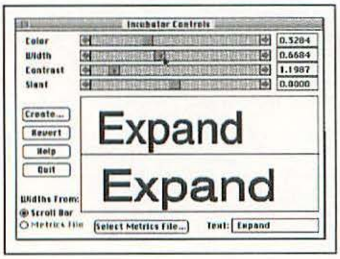


Transform

Slant angle: 0 degrees, clockwise
Horizontal offset: 0 1000ths of an em
Vertical offset: 0 1000ths of an em
Horizontal scale: 120 %
Vertical scale: 100 %
Width scale: 100 %

To scale a font in ParaFont:

1. **Choose New from the File menu.**
2. **Choose the font you want to scale from the Base Font pop-up menu.**
   Select the Bold and Italic check boxes if you want to scale those styles, too.
3. **Choose Font Attributes from the File menu and type a name for the new PostScript font — for example, TimesCondensed or TimesFat.**
   A PostScript font name can't have a space in it.
4. **Choose Select All from the Edit menu and then choose Transform from the Edit menu.**
5. **Type the desired scaling percentage in the Horizontal Scale text box.**
6. **Use the File menu's Make Screen Fonts and Make PostScript Font commands to generate bitmap and PostScript outline fonts.**
7. **Install the fonts in your system.**



Incubator Controls

Color 0.3284
Width 0.6684
Contrast 1.1987
Slant 0.0000

Widths From:
● Scroll Bar
○ Metrics File

Text: Expand

To scale a font with Incubator Pro:

1. **Choose the font you want to modify from the Font menu.**
2. **Use the Width scroll bar to condense or expand the font.**
   Use Incubator Pro's sample text display and preview window to see the results.
3. **Click the Create button.**
4. **Type a name for the font, click OK, and then click Save.**
5. **Install the resulting font file in your system.**

Because horizontal scaling distorts the proportions of a typeface, it compromises the original type design. To remain as faithful as possible to the original design, avoid scaling by more than 25 percent or so in either direction unless you're after a particularly dramatic or gaudy effect.

Serving Multiple Masters

Adobe's Multiple Master font technology enables you to horizontally scale fonts without compromising the original type design. Multiple Master fonts are a font customizer's dream. Besides being able to expand or condense a font, you can also create any weight from extra light to extra bold.

With Multiple Master fonts, you can create a limitless number of font variations from a single typeface. For example, instead of having only three type weights — light, medium, and bold — to choose from, you can generate any weight ranging from ultra-light to extra-bold. Similarly, instead of having only condensed, normal, and expanded styles, you can generate any width — from ultra-skinny to bloated, including any width in between.

How Multiple Master fonts work

Each of these style variations is called a *design axis.* Most Multiple Master fonts offer at least two axes. The weight axis governs lightness or boldness, while the width axis controls condensation or expansion.

Each end of each design axis in a Multiple Master font has a *master design.* For example, the weight axis has light and bold masters. All other weights in between are generated — in tech talk, *interpolated* — from these masters. This explains the Multiple Master name: A given typeface's appearance is actually determined by multiple masters instead of just one master.

The Multiple Master format allows for two additional axes. The *optical scaling* axis provides masters designed for small type sizes as well as large ones. (Multiple Master's support for an optical scaling axis represents a major milestone in digital typography; the Background box "Optical Scaling Advantages" explains why.) The *style axis* controls the actual design of the typeface. A Multiple Master font with a style axis can enable you to generate sans-serif, small serif, medium serif, or large serif fonts — or anything in between.

More memory required

There is a potential drawback to using Multiple Master fonts: They devour printer memory. Because of the complexity of the Multiple Master format, Adobe recommends you have at least 3MB of memory in your PostScript printer. If you have a low-end or mid-range PostScript printer, you may need to add memory to it in order to print a Multiple Master font. (See Chapter 32 for details on PostScript printer memory.)

Getting Fractional

If I had a dime for each time I saw a phony fraction such as 1/2 in an otherwise good-looking publication, I'd be rich. Besides taking up more space, phony fractions are unattractive and one of desktop publishing's dead giveaways. You can create your own fractions the hard way by reducing the type size of the numbers and then, if your word processor or publishing program allows, shifting the numerator up by a few points. As I described in the previous chapter, you can also buy fonts containing ready-made fractions; best of all are the expert sets some font vendors sell, which have true-cut fractions designed to match a specific typeface, with the design of the small numerals tweaked for better legibility.

BACKGROUNDER

Optical Scaling Advantages

In the days of hot metal type, different molds were required to cast different sizes of type. As a result, a separate mold was cut for each point size, and type designers made small adjustments to letter spacing, character proportions, and weight so that each size would be as legible as possible.

When phototype and digital type became popular, this practice of creating separate masters for each size went out the window. Instead, most typesetting equipment used one master font and scaled the type to the size required — originally by moving lenses closer to or further away from the font negative, later by mathematically scaling a font outline. In both cases, small type became less legible because it was simply a scaled-down version of a larger size.

The optical scaling axis brings the legibility advantages of separate masters to the digital typographer. In Adobe's Minion Multiple Master typeface, as the type size increases, the space between characters, the *letterfit,* decreases; the spaces within characters, the *counterforms,* close up; the serifs become finer; the overall weight of the type becomes lighter; and the x-height becomes smaller. These are the same basic techniques that a hot-metal type designer would use to optimize legibility at various sizes — updated for the digital age.

You can also customize an existing font to create your own fractions — even oddball ones like $^{15}/_{128}$. It's easiest in FontMonger and ParaFont. When creating a fraction, ParaFont extends numerals slightly to make them more legible in their small size — a nice touch. The results still don't quite compare to the true-cut fractions that accompany expert font sets, but they're close. ParaFont's other customizing options use similar techniques; for example, the program can simulate old-style figures — numerals with ascenders and descenders, usually available only in expert sets — by condensing certain characters and moving them up or down.

You can find instructions for creating fractions in FontMonger and ParaFont in the Step-by-Step box "Makin' Fractions."

Turning Text into Pictures

Many company logos consist of text that has been stylized, reshaped, shaded, or otherwise modified. Using Altsys' Metamorphosis Professional (Meta Pro, for short), you can convert a passage of text into an object-oriented PICT graphic that you can paste into a graphics program and polish as you please. (See Chapter 13 if you're unfamiliar with graphics formats such as PICT, TIFF, and EPS.)

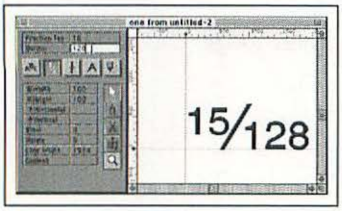
In Meta Pro's main window, click the Convert Text button and choose the PICT to Clipboard option from the Format pop-up menu and choose the Type Your Own option from the Text pop-up menu. Choose the desired font, style, and size from their respective menus (a large size such as 100-point gives the best results — you can scale it down later). Type the text you want to convert in the text box and then click Convert (see Figure 12-2 "Prose to Picture").

After the conversion is complete, switch to a graphics program and paste. If you paste into Claris MacDraw II or MacDraw Pro, you can reshape an individual character by selecting it and then choosing Reshape from the Edit menu. Keep in mind you aren't able to edit or reformat the text once it's a graphic. If changes are required, you have to return to Meta Pro and start over.

Meta Pro can also save converted text in a PICT or Encapsulated PostScript (EPS) file that you can open using an object-oriented drawing program or import into a publishing program. Meta Pro can also convert fonts themselves from one format to another. If you have Type 3 PostScript fonts, for example, you can convert them to Type 1 format for use with Adobe Type Manager. Meta Pro can even convert fonts for or from an IBM PC or NeXT computer. If you have a Mac and a PC, you can convert Mac fonts into ones usable by the Mac-like Microsoft Windows software.

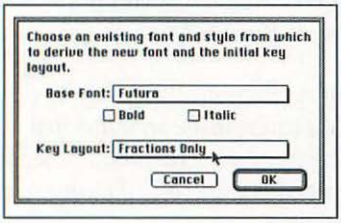
Makin' Fractions

Using actual fractions instead of full-size numerals can add a professional touch to your documents. The following instructions show how to make fractions in FontMonger and ParaFont.



To make a fraction in FontMonger:

1. **Use the Open command to open the font for which you want to create a fraction.**
2. **When the keyboard display appears, select the key to which you'll assign the fraction.**
   To use an Option-key or Shift-Option-key sequence, click the appropriate modifier key in the keyboard display.
3. **After selecting a spot for the fraction, choose Alter Character(s) from the Alterations menu.**
   The Alter Character window opens.
4. **Select the type of fraction you want and then type the numerator and denominator in the appropriate text boxes.**
5. **Click the window's close box.**
6. **Save the font using a different name to avoid replacing the original.**
7. **Install the resulting fonts in your system.**



Choose an existing font and style from which to derive the new font and the initial key layout.

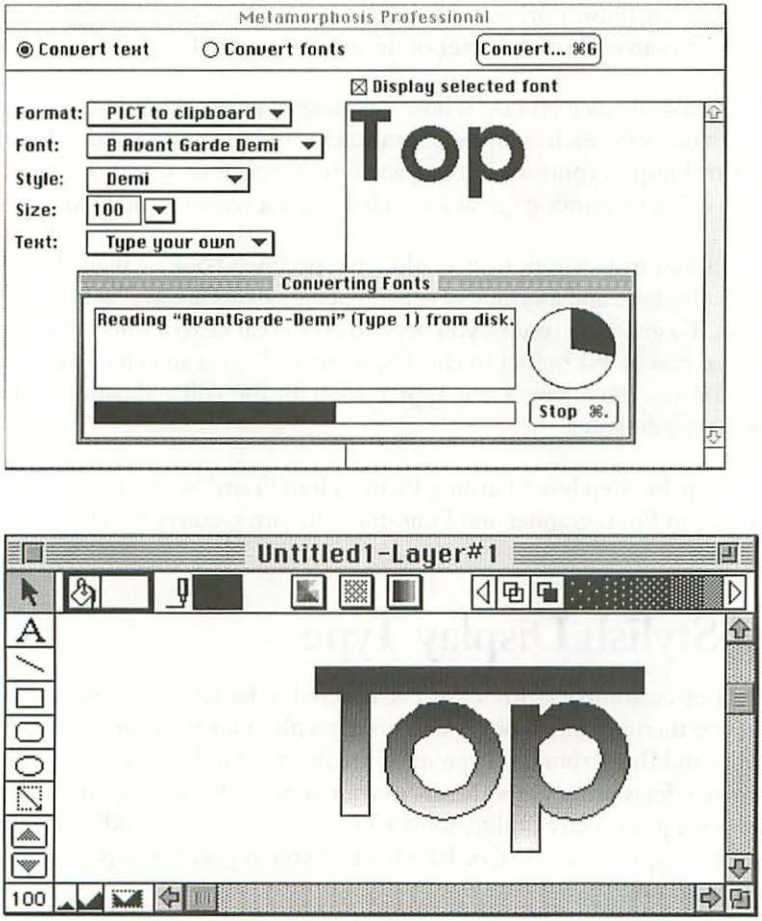
Base Font: Futura

☐ Bold ☐ Italic

Key Layout: Fractions Only

To make a fraction in ParaFont:

1. **From the Base Font pop-up menu, choose the font for which you want to create fractions.**
2. **Choose Fractions Only from the Key Layout pop-up menu, and then click OK.**
   ParaFont creates a font containing common fractions. You can double-click a fraction in the keyboard display to specify your own numerators and denominators.
3. **Use the File menu's Make Screen Font and Make PostScript Font commands to generate the bitmap and PostScript outline fonts.**
4. **Install the resulting fonts in your system.**



Metamorphosis Professional

● Convert text ○ Convert fonts

☒ Display selected font

Format: PICT to clipboard

Font: B Avant Garde Demi

Style: Demi

Size: 100

Text: Type your own

Converting Fonts

Reading "AvantGarde-Demi" (Type 1) from disk.

Figure 12-2: Prose to Picture Metamorphosis Pro can convert text you type into a PICT graphic that you can modify by converting the text (top), and then pasting it into MacDraw Pro, where the *T* can be reshaped and a gradient fill applied (bottom).

Turning Pictures into Text

Another customizing task involves adding graphics such as a scanned image or an image from a clip art collection to an existing font. You may start by scanning an original — your signature or company logo, perhaps — and then saving the resulting image. Scan a large original if possible (for example, if you're scanning your signature, write big); you get more detail in the resulting font. After scanning the original, import the scan into Fontographer or FontStudio and use the program's *autotrace* feature to trace the image. In a PostScript illustration program such as

FreeHand or Illustrator, you may prefer to trace the image using it. In either case, the result is an outline character of the art you scanned.

This scan-and-trace process is how font developers work: A designer hand-draws large masters for each character, scans them, and then traces them. You can apply these techniques yourself to create an entirely new font. Create a font of your handwriting or printing (great for architects; not recommended for physicians).

Make a font from a sample in an old type specimen book — many books containing old display type and a variety of ornamental dingbats are available from Dover Books. To get good results, you need to do a great deal of fine-tuning and print a ream or two of test output to check spacing in all sizes and character combinations. When done, you'll have a new appreciation for the skill and patience of a professional type designer.

The Step-by-Step box "Turning Pictures into Fonts" summarizes the steps you perform in Fontographer and FontStudio to turn pictures into fonts.

Creating Stylish Display Type

The font-customizing programs I've covered so far let you create and modify fonts that you then install in your system to use with other programs. Letraset's LetraStudio and Brøderbund's TypeStyler are designed to let you create special typographic effects using fonts already in your system. (Both programs also provide their own proprietary outline fonts.) The result of a LetraStudio or TypeStyler session is typically a PICT or EPS file that you import into a publishing or illustration program.

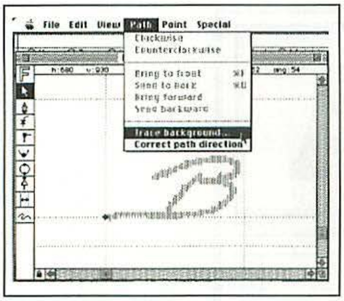
How type-effects programs work

With either LetraStudio or TypeStyler, start by typing text and then formatting it in the desired font. Next, you might fine-tune the character spacing; instead of requiring you to use awkward ⌘-key sequences to adjust spacing (as do publishing programs), both programs let you simply drag characters left or right — a more efficient and direct technique. After you tweak the spacing, you might draw a shape and resize the type to fit within it (see Figure 12-3 "Styling Type"). Nothing illustrates the flexibility of outline fonts like watching characters recast themselves to fit a shape you draw.

Both TypeStyler and LetraStudio can work with PostScript and TrueType fonts and also include a few display typefaces. If you work with display type frequently, investigate Letraset's Fontek library of over 100 display typefaces. Each Fontek package includes both TrueType and Type 1 PostScript versions of the first-rate display type that Letraset has been selling for years.

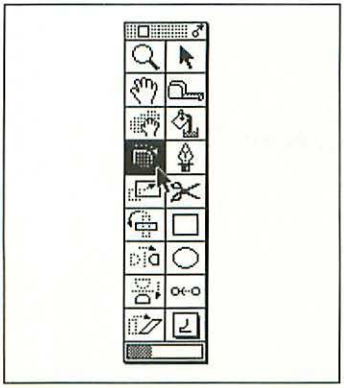
Turning Pictures into Fonts

You can use a font-editing program to create a font containing a graphic image such as your scanned signature, a piece of clip art, or a scan from an old type-specimen book. The process is arduous, but the following instructions will get you started.



To create a custom character using Fontographer:

1. **Put the scanned image on the Mac's Clipboard.**
   Using a graphics program or your scanner software, select the image and choose Copy from the Edit menu.
2. **Start or switch to Fontographer and open the font you want to modify.**
3. **Select the character position for the new character and double-click the character position to open the character-editing window.**
4. **To remove the character already in that character position, choose Select All and then Clear from the Edit menu.**
5. **Choose Paste from the Edit menu.**
   The image appears in gray.
6. **Choose Trace background from the Path menu and click OK.**
7. **Fine-tune the resulting outline if desired and then close the outline window.**
8. **Repeat the preceding steps for each character you want to create.**
9. **Use the File menu's Generate Fonts command to make the font that you'll install in your system.**



To create a custom character using FontStudio:

1. **Using your scanner software or a graphics program, save the image in TIFF, PICT, or MacPaint format.**
   FontStudio doesn't accept scans from the Clipboard; you need to save an image and then open it in FontStudio as a template.
2. **Use the File menu's Unpack Suitcase command to open the font you want to modify.**
3. **Open the font window by double-clicking the appropriate bitmap or outline-font icon in the Family window.**
4. **Double-click the character you want to replace.**
5. **To remove the character already in that character position, choose Select All and then Clear from the Edit menu.**

(continued on the next page)

(continued from the previous page)

6. **Choose Open Template from the Characters menu and double-click the image's name.**
7. **Select the autotrace tool (highlighted in figure) and then click within the character editing window.**
8. **Fine-tune the resulting outline if you like, and then generate the font.**

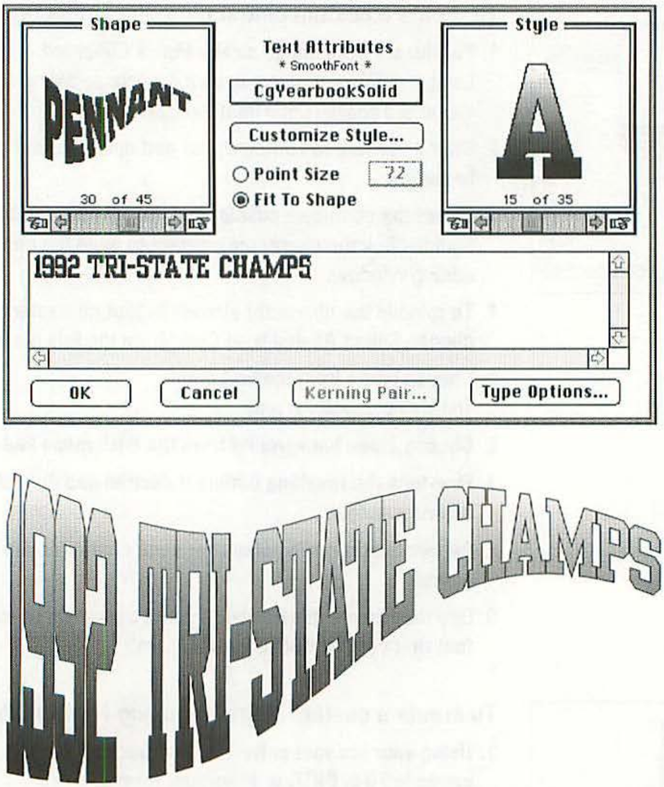


Figure 12-3: Styling Type When you create display type with TypeStyler you can specify the text, the desired font, the effect, and the shape the text will fit into (top), and then display the resulting effect (bottom).

A simpler effects program is PostCraft International's Effects Specialist, which lets you apply 120 special effects to text you type. Effects Specialist isn't in the TypeStyler or LetraStudio league — it doesn't, for example, let you fit type to irregular shapes and manually kern by clicking and dragging characters. But it does provide more special effects than TypeStyler and LetraStudio, and you can modify those effects in a dizzying number of ways.

Bigger, better banners

For those who think big, there's Brøderbund's BannerMania. This fun program lets you create, yes, banners — choose one of the 50 built-in designs, type your text in any of 19 built-in fonts (or use any Type 1 PostScript font), apply one of the 34 built-in special type effects and 134 built-in color schemes, print, and then assemble the resulting pages. You can also customize designs, type effects, and color schemes. It's a sign-maker's playground.

Font Futures

There are enough options out there to keep a font customizer busy for years, but there's even more on the horizon. Apple has announced enhancements to the Mac's system software that will simplify the creation of three-dimensional fonts and give TrueType features similar to those of Adobe's Multiple Master fonts.

Speaking of the third dimension, if you want to create stunning 3-D type, investigate Pixar's Typistry. Typistry lets you create 3-D text from existing fonts. After typing some text, you can apply a variety of surfaces — from woodgrain to marble to chrome — as well as simulate various lighting effects. You can also animate the text and create QuickTime movies of the results (see Chapter 15 for more details on Typistry and other 3-D tools, and Chapter 21 for the scoop on QuickTime).

Note that some font-customizing tasks — for example, fitting text to a shape, stretching and condensing a font, applying special PostScript effects and gradients — lengthen printing times, especially for a PostScript-based imagesetter. If you're creating a document laden with effects, prepare to wait — and to pay more if you use a service bureau that charges by the hour.

If your patience and budget don't restrain you from going overboard, let your sense of good taste do so. Don't go crazy with glitzy effects. Good font customizers work like jazz musicians — they improvise and customize, but they also preserve the essence of the original.

CHAPTER 12 CONCEPTS AND TERMS

- Outline fonts such as PostScript and TrueType fonts are more versatile than bitmapped fonts because one outline can be used to generate any type size.
- Another plus for outline fonts is their ability to expand or condense.
- Font utilities such as Fontographer, FontMonger, Incubator Pro, FontStudio, and Metamorphosis Professional enable you to customize and create fonts.
- Adobe's Multiple Master fonts can be expanded and condensed without compromising the original design and have other sophisticated advantages over conventional outline fonts.
- With display type programs such as LetraStudio and TypeStyler, you can create special text effects and meticulously spaced headlines.

autotrace
A feature in font-editing (and some illustration) programs that generates an outline from a bitmap image.

bitmap font
Also called a *fixed-size font,* a font in which characters are described by an arrangement of bits. A separate arrangement is required for each type size, making bitmap fonts less flexible than outline fonts.

condensed
A skinnier version of a given typeface.

downloadable font
A font whose outline resides on your Mac's hard disk and is transferred to a printer's memory before use.

expanded
A fatter, stretched version of a given typeface.

optical scaling
The process of adjusting character shapes and spacing for maximum legibility at a given point size.

outline font
A font in which characters are described by mathematical equations; by processing these equations, the Mac can create characters of virtually any size.

resident font
A font that is built into a printer.

scale
The process of deriving a required type size from a bitmap of a different size.

Type 1 font
The most common and preferable format for PostScript downloadable fonts.

Type 2 font
There's no such beast — Type 2 was reserved for a font technology that never panned out.

Type 3 font
A less-common PostScript outline font format that generally delivers inferior results on laser printers.

CHAPTER THIRTEEN

Painting, Drawing, and CAD Programs

IN THIS CHAPTER

- Comparing pixels with objects in painting and drawing programs
- Using graphics programs even if you're not a Mac Monet
- Introducing computer-aided design (CAD) programs
- Creating special effects using Aldus FreeHand and Adobe Illustrator
- Moving images to other programs and comparing graphics file formats

Word processors may be the Macintosh world's most popular applications, but graphics programs are the most appealing. Start up a word processor for a few friends and they'll probably show lukewarm interest. But fire up a graphics program and watch them line up for their turn at the mouse. People who would never dream of standing in front of an easel and canvas suddenly become artists-in-training, spilling paint all over the screen.

Perhaps graphics programs are enticing because people traditionally view a computer as a tool for calculating, not as an artistic medium. Or maybe it's the sense of experimentation that draws you in. Move the mouse, get a circle. Oops, erase that mistake. Hey, the little spray can works just like a real one.

Ever since MacPaint blazed the trail in 1984, graphics programs have been instrumental to the Mac's success. There are more ways to create images with the Mac than there are to process words — proof of the machine's graphical bent. In this chapter, I'll explore some of the technicalities behind Macintosh graphics and spotlight the features you'll find in the most popular graphics programs. And because not everyone has artistic aspirations, I've included tips throughout the chapter describing other ways to put graphics software to work.

ON THE CD

- Adobe Illustrator
- Aldus IntelliDraw
- Aldus FreeHand
- Aldus SuperPaint
- Claris ClarisWorks
- Deneba Software's Canvas

QUICK TIPS

Putting a Graphics Program to Work

#1: Spruce up a business graphic

The graphs and charts created by programs like Microsoft Excel and Lotus 1-2-3 are actually object-oriented drawings. You can use the Clipboard to move them into a draw program for further polishing.

To copy a graph, select it and choose Copy from the Edit menu. Start or switch to your graphics program and choose Paste. If you're working in an integrated program, simply create a new graphics document and then choose Paste.

When you paste a graph, the drawing program treats it as a single object. To modify an individual element such as a bar or axis line, you need to ungroup the object: Select the graph and then choose your program's Ungroup command. (In Claris' MacDraw series and in ClarisWorks and Microsoft Works, Ungroup is in the Arrange menu.)

After you ungroup the graph, what changes should you make? Try adding gradient fills to bars or pie wedges. Change the font, size, or style of the graph's labels and legends (you can do this in your spreadsheet or graphing program, too). Add icons or logos or scanned images. Replace the bars in a bar chart with icons that represent the data (for example, use automobile icons in a car-sales chart); use a clip art collection or some characters from pictorial fonts such as Zapf Dingbats or Zeal.

Different Strokes

All graphics programs share the same basic operating style. Start one up, and you get a new, untitled document window surrounded by one or more tool palettes for creating various shapes — circles, rectangles, lines, arcs, and so on — and for adding text to an image. To create a shape, you click the tool for that shape, move the mouse pointer into the window's drawing area, and drag (see Figure 13-1 "Electronic Easels").

Graphics programs come in two basic flavors — *bitmapped* and *object oriented.* Their different approaches to storing and printing images make each type of program suited to specific purposes. Because of this, some programs combine both approaches. In any case, understanding the differences between bitmapped and object-oriented graphics is an important first step in choosing graphics software and using it effectively.

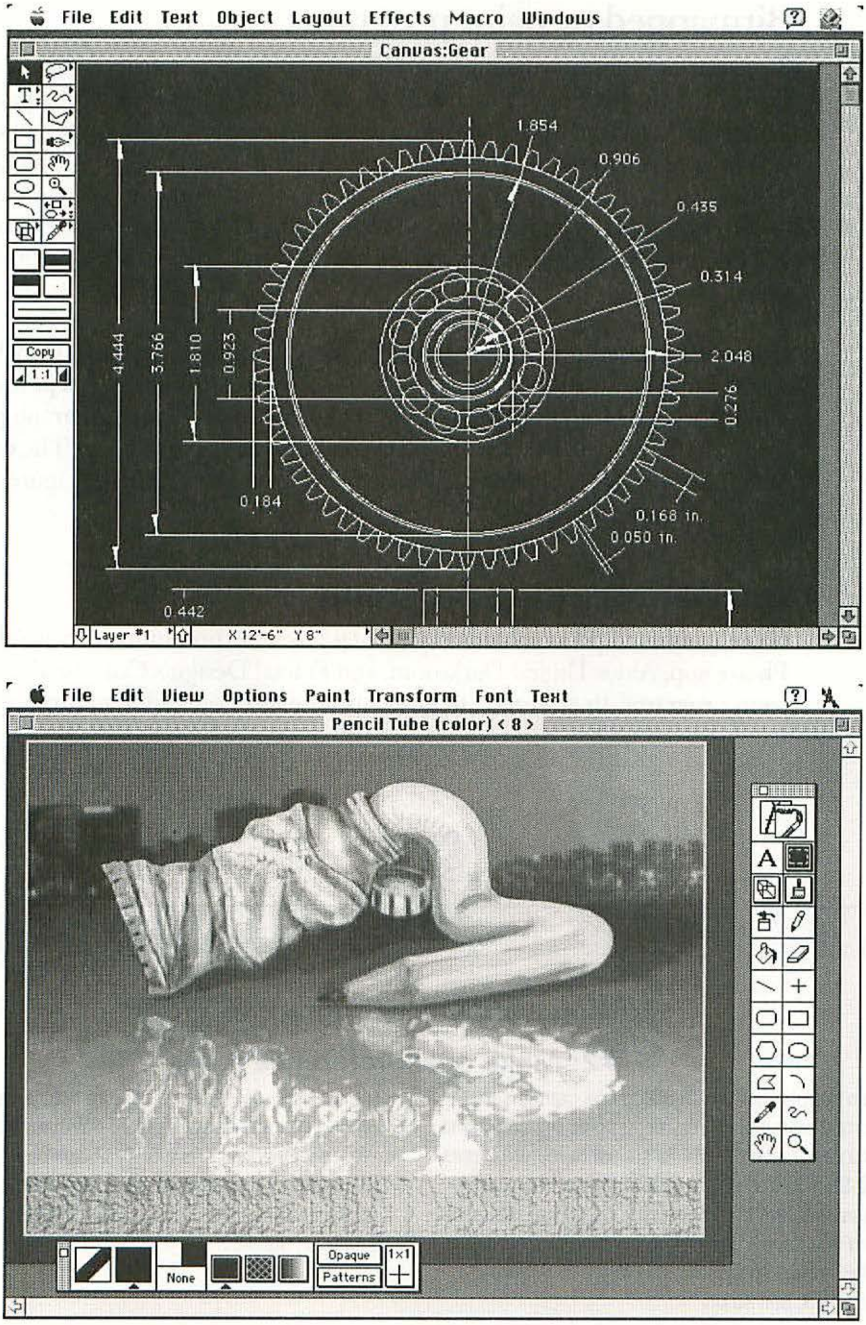


Figure 13-1: Electronic Easels Two popular graphics applications: Deneba Software's Canvas (top) and Aldus SuperPaint (bottom). Note the similar tools each provides for drawing, selecting, and modifying images.

Bitmapped or paint programs

Bitmapped graphics, or paint, programs store images as a series of bits — ones and zeros — in the Mac's memory. With monochrome (black-and-white) paint programs such as MacPaint, each screen dot, or *pixel*, in an image corresponds to one bit in the Mac's memory. If a dot is black, its bit is a one; if a dot is white, it's a zero. Think of a sheet of graph paper. Each square is a bit, and you create images by darkening some squares and leaving others white. To change part of the drawing, you get out your pencil and eraser and change black squares to white ones and vice versa.

Color paint programs such as SuperMac's PixelPaint Professional, Deneba Software's UltraPaint, and Fractal Design's Painter work similarly, except they assign more than one bit to each pixel. It's as if you laid several sheets of graph paper on top of each other, and selectively blackened squares on each layer. The on-off combinations of a pixel's bits tell the Mac what color that pixel is (see Figure 13-2 "Bitmaps Versus Objects").

Image processing programs

Close cousins to paint programs are *image processing* programs such as Adobe Photoshop, Aldus Digital Darkroom, and Fractal Design's ColorStudio. Like color paint programs, they work with bitmapped images containing multiple bits per

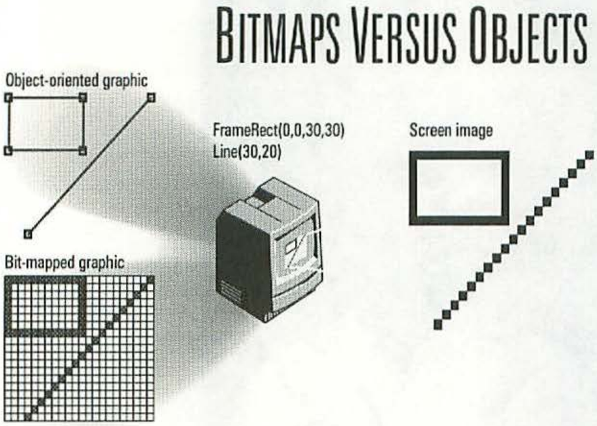
QUICK TIPS

Putting a Graphics Program to Work

#2: Make quick-reference cards

Can't remember which dialog box contains that certain option or which menu holds the command you need? Use the Mac's snapshot feature (press ⌘-Shift-3) to create a PICT image of the screen; then annotate the image with text. Print the result and you have a custom quick-reference card. The Mac names snapshot files *Picture 1, Picture 2, Picture 3,* and so on.

The snapshot feature can capture color screens, although it can't capture pulled-down menus or any event that involves the mouse button being pressed. To capture pulled-down menus, you need a utility such as Mainstay's Capture. See Chapter 25 for more details on utilities.



A bitmapped graphics program such as MacPaint maps screen pixels to bits in the Mac's memory (1 bit per pixel for monochrome programs, 8 bits for grey-scale and most color paint programs, 24 bits for high-end color programs). The on-off combinations of those bits specify each pixel's color. A drawing program such as MacDraw stores QuickDraw instructions that describe the image. Regardless of the type of program it was created in, a graphic, like all Mac screen images, is displayed on the screen as a bitmapped image.

Figure 13-2: Bitmaps Versus Objects

pixel. But image processing programs are designed primarily for retouching and modifying images created by a scanner or video camera. Chapter 14 contains details on image processing programs and the up-and-coming field of electronic photography.

On Macs with color or gray-scale video hardware, these programs display true shades of gray. On monochrome Macs, they simulate gray by combining black pixels and white pixels into patterns, a process called *dithering* (see Figure 13-3 "True Gray").

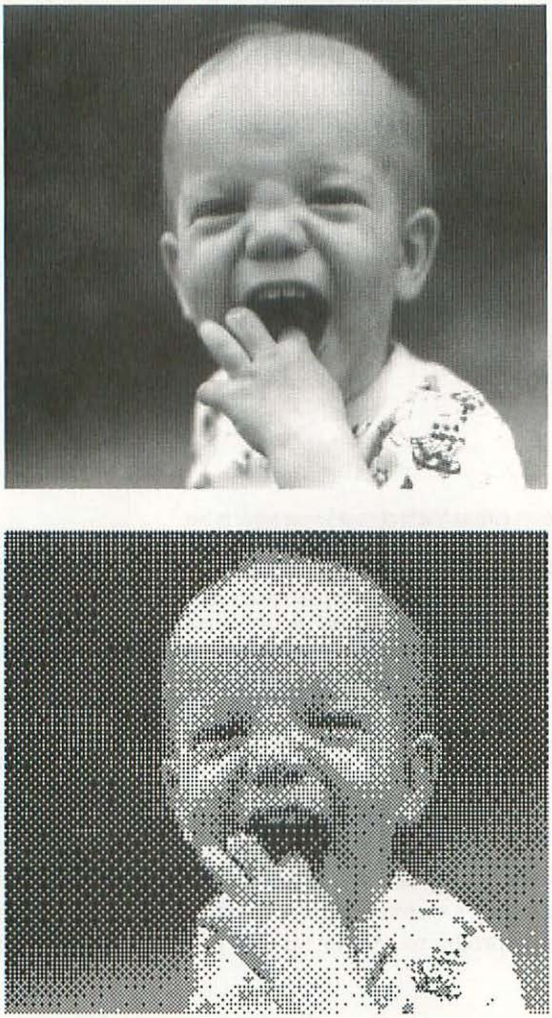


Figure 13-3: True Gray For serious graphics work, use a Mac capable of displaying colors and gray-scale images (top). To simulate grays, monochrome Macs must use dithering (bottom), which makes fine detail work difficult.

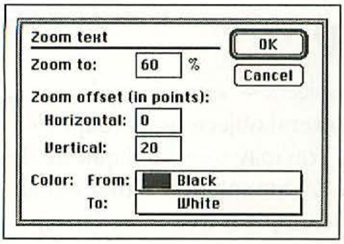
Drawing Distinctions

When you create an image — such as a circle — with a paint or image processing program, as soon as you release the mouse button the circle loses its identity as a circle and becomes simply a series of pixels. You can't change the circle's size, line thickness, or any other characteristics; instead, you must erase its pixels and create a new circle.

STEP-BY-STEP

Creating a Zoom-Text Effect with FreeHand

Want to spice up a poster or advertisement? Try creating a zoom-text effect, in which a line of text appears to be zooming towards you. Aldus FreeHand provides a zoom text feature. The steps in this box show you how to use it.



Zoom text

Zoom to: 60 %

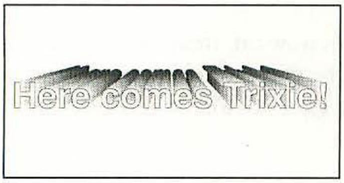
Zoom offset (in points):

Horizontal: 0

Vertical: 20

Color: From: Black

To: White


Here comes Trixie!

To create a zoom-text effect:

1. **Type the text you want to zoom using FreeHand's text tool and format it in the desired font, size, and style.**
2. **Select the text box and choose Zoom Text from the Effects submenu (in the Type menu).**
   The Zoom text dialog box appears.
3. **In the Zoom To box, type** 60.
   This tells FreeHand to make the text at the beginning of the zoom effect 60 percent of the text's current type size. If you want the text to appear even smaller, type a smaller value.
4. **In the Horizontal box, type** 0.
5. **In the Vertical box, type** 20.
6. **Optional: Specify beginning and ending colors for the effect.**
   If you don't perform this step, the effect begins with black text that gets gradually lighter as it zooms towards you, as shown at left.
7. **Click OK or press Return.**
   Note that using a zoom-text effect lengthens printing times.

Not so with images created by an object-oriented, or draw, program. Programs such as Claris' MacDraw II and MacDraw Pro treat images not as a series of bits, but as a series of drawing instructions for QuickDraw, the fundamental graphics routines that are responsible for everything you see on the Mac's screen. When you draw a circle, the program stores a set of QuickDraw instructions describing the circle's characteristics — its radius, line thickness, whether it's filled with a pattern, and so on. To change the circle's size, you simply select and resize it. The program then updates the circle's QuickDraw instructions. It's as if you're creating images not by blackening squares on graph paper, but by creating a list of instructions that tell your pen — the electron beam in a monitor, the print wires in an ImageWriter, or the laser in a LaserWriter or typesetter — how and where to move.

The same pixels-versus-objects issue also applies to text. With paint programs, editing or reformatting text means retyping it. Draw programs let you use the same editing and formatting techniques as a word processor.

Working with Objects As a Group

A finished drawing consists of numerous separate objects — sometimes thousands of them. But what if you want to move or modify several objects as a group? For example, after drawing a floorplan for a bathroom, you may want to duplicate the layout for another bathroom elsewhere in the house. One solution is to select all the objects and then copy and paste, but a better technique is to use the Group command that all drawing programs provide.

A Group command tells a drawing program: "From now on, treat the objects I've selected as a single object." When you group objects, you can select, move, and modify them as if they were one object (see Figure 13-4 "Before and After Grouping").

When you group objects into one object, you can't modify an individual item within the group. For example, if you decide to make the bathroom sink larger after you've grouped all the bathroom objects, you can't simply select the sink and resize it. In order to modify an object within a group, select the group and choose your program's Ungroup command.

Speaking of selecting, drawing and painting programs each provide their own types of tools and techniques for selecting the parts of an image. The Background box "Graphics Selection Tools" describes the most common tools you'll encounter and provides some tips for using them.

Putting a Graphics Program to Work

#3: Make a start-up screen

You can replace the "Welcome to Macintosh" message with any image you like. Many monochrome paint programs, including MacPaint and SuperPaint, can create start-up screens. The image must be named *StartupScreen* and reside in the top level of the System Folder — not within any folders such as the Extensions folder.

You can also create color start-up screens. For the Mac to correctly display a color start-up screen, the image file must be saved in a special format (technically, it must be a PICT file that contains a PICT resource with an ID number of 0 — that's the number zero). Several popular programs, including Canvas, SuperPaint, and PixelPaint, can create start-up screen PICT files. You can also create start-up screen PICT files with a shareware program called The Giffer, by Steve Blackstock.

If you have more than one monitor, you can specify which monitor you want to use for the start-up screen. You may want to do this if you have one color monitor and one full-page monochrome monitor and you want the start-up screen to appear on the color monitor.

To control where the start-up screen appears, open the Monitors control panel and press the Option key. When you press Option, a Mac with a smiling face appears on the monitor displaying the start-up screen. If you want the start-up screen to appear on a different monitor, continue pressing Option while you drag the smiling face to that monitor.

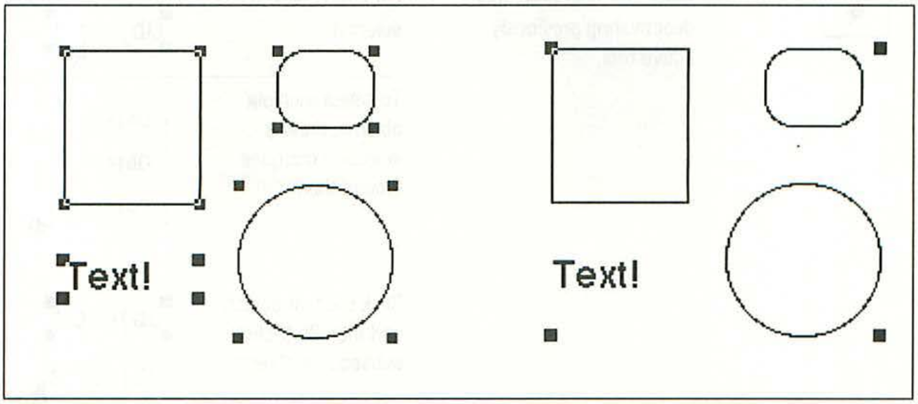


Figure 13-4: Before and After Grouping A Group command tells a drawing program to treat a series of selected objects (left) as one object (right). After grouping objects, you can select, resize, and reposition them as if they were one object.

BACKGROUNDER

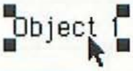
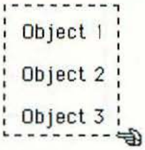
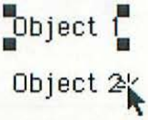
Graphics Selection Tools

Painting and drawing programs each provide several tools for selecting parts of a drawing. The illustrations in this box show the most common graphics selection tools and techniques.

Selection Techniques in Paint Programs

Tool	***What it Does***	***Example***	***Tips***
	Selects irregularly shaped areas		You don't have to completely enclose the area you're selecting; when you release the mouse button, the program completes the selection for you
	Selects rectangular areas		Double-click to select an entire image

Selection Techniques in Draw Programs

Tool	***What it Does***	***Ways to Use***	***Example***
	Activates selection mode, deactivating previously active tool	Click an object to select it	
		To select multiple objects, draw a selection marquee around them	
		— or —	
		Click the first object, and then Shift-click subsequent objects	

Hard Copy Differences

Another big difference between paint and draw programs becomes evident when you print images, especially on a laser printer or imagesetter. With paint programs, images are tied to a specific resolution, a fixed number of dots per inch (dpi). For example, a MacPaint image's resolution matches that of the Mac's screen — 72 dpi. Print a 72-dpi image on a 300-dpi laser printer, and you'll notice jagged-edged text and shapes. (You can even out the jaggies somewhat by using the Page Setup dialog box's Graphics Smoothing option, but the results still aren't great.)

Some paint programs let you create bitmaps with up to 300 dpi, but that isn't a perfect solution either. For one thing, a 300-dpi image is still locked into a specific resolution. For another, 300-dpi bitmaps devour memory and disk space — an 8 ½ by 11-inch monochrome image uses about a megabyte of disk space. The storage toll increases for color and gray-scale images.

ImageWriters are prone to a subtler problem when printing bitmapped images. When you choose the ImageWriter's Faster or Best print-quality options, the ImageWriter prints roughly 80 horizontal dots per inch. When you print a 72-dpi bitmapped image on an ImageWriter, the slight difference in resolution can cause bitmapped images to appear distorted, compressed by about 13 percent — not a lot, but enough to turn a circle into an oval. The solution: Select the Tall Adjusted option in the Page Setup dialog box. Tall Adjusted compensates for the difference in resolution, but at a price: Text is widened along with the adjusted picture. A five-inch column of text expands to over 5 ½ inches.

QUICK TIPS

Putting a Graphics Program to Work

#4: Create organizational charts

Many businesses rely on organizational charts to visually spell out the pecking order. You can create an organizational chart using the box and text tools in any drawing program, but if you have to revise organizational charts frequently (IBM and General Motors, take note), consider a program that's built for the job, such as Kaetron's OrgChart Express. Aldus IntelliDraw also has smart linking features that streamline creating organizational charts.

An organizational chart is a type of *tree chart.* You can also use tree charts for family trees, block diagrams, and time lines. Many presentation programs can also create tree charts. Use the program's built-in outliner to specify the reporting structure, with subordinates indented from their supervisors. Then tell the program to create a tree chart.

Putting a Graphics Program to Work
#5: Add graphics to a database

Most database managers let you create custom forms and paste images from the Clipboard into your form designs. Use this technique to add a logo to a form. Create the logo in a graphics program, and then copy and paste it into the form.

And as you saw in Chapter 7, Claris' FileMaker Pro lets you create on-screen buttons that execute scripts when clicked. You can create basic buttons in FileMaker Pro, but if you want a flashier look, create them in a drawing program and then use the Clipboard to paste them into a FileMaker Pro layout. Buttons with graduated fills or 3-D shading can give a fashionable look to your database.

Images created with draw programs, on the other hand, tend to use far less disk space and memory, and they're not tied to a specific resolution. You can print the same image on an ImageWriter, LaserWriter, or 2540-dpi imagesetter and get progressively better results. You're playing back the same drawing instructions each time you print, but with a progressively sharper electronic pen.

Object-oriented graphics can also be resized without the distortion and undesirable patterns bitmapped graphics are prone to. And because draw programs know that text is text, they can take advantage of the tack-sharp outline fonts used by PostScript printers, Adobe Type Manager, and Apple's TrueType. (See Part III for more details on printer font outlines.)

Paint or Pen?

So how do you decide whether you need a paint or a draw program? A paint program is the tool of choice when you need to create images with photographic details, fine shading, or brush-like effects. Paint and image processing programs are also required for working with scanned images, because these are always bitmapped.

All paint programs also provide tools for drawing simple shapes, for selecting a portion of an image to move or copy to the Mac's Clipboard, and for zooming in on an image to work with individual pixels. Simple monochrome paint programs

QUICK TIPS

Putting a Graphics Program to Work

#6: Create special text effects

It's easy to stretch or condense text by using a draw program in conjunction with a desktop publishing program or word processor. First, type the text using the draw program. Next, select the entire block of text (not its individual characters) using your draw program's arrow-shaped selection tool and then copy the selection to the Clipboard. Switch to a word processor or publishing program and choose Paste, and you have a picture of the text that can be resized.

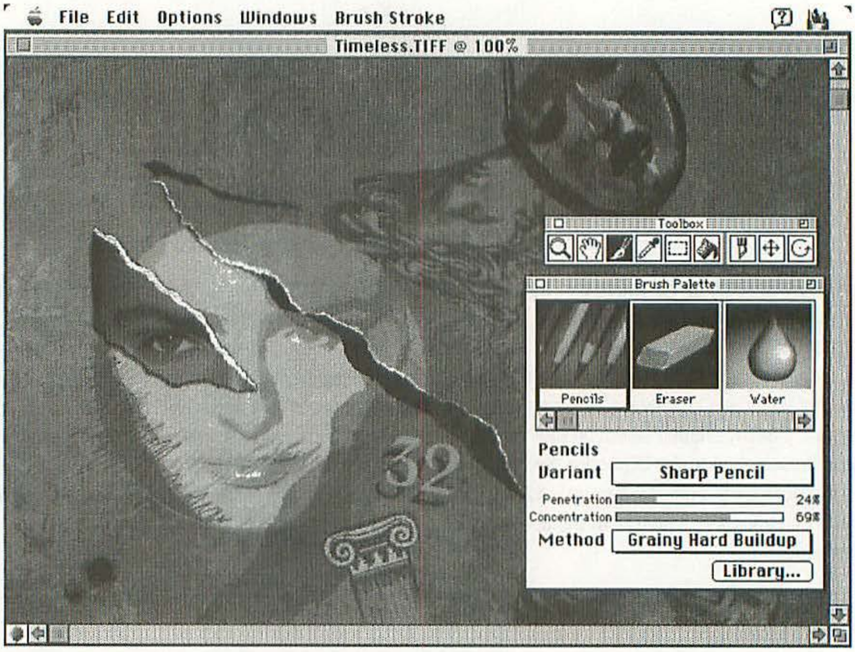
If you don't have Adobe Type Manager and you aren't using TrueType fonts, the resized text will probably look ragged on screen, but it will print with sharp edges. Note that this technique may not work with every combination of word processor and drawing program. For example, when you paste text from MacDraw II or MacDraw Pro into Microsoft Word, it appears as conventional text, not as a graphic.

offer a variety of brush shapes, a pencil tool, and a spray can for creating on-screen graffiti. Advanced color paint programs provide these tools as well as tools for obtaining charcoal and watercolor effects (see Figure 13-5 "Painting with Painter").

Draw programs are better suited to creating line drawings such as architectural floor plans, newspaper graphics, and technical drawings. Programs like Deneba Software's Canvas, and Claris' MacDraw II and MacDraw Pro provide features that help you create drawings to scale. In most draw programs you also find *dimensioning* features that automatically display an object's dimensions in your choice of measuring systems.

Layering features let you divide a drawing into layers, each of which is like a sheet of clear plastic. If you're creating a house floorplan, you may use one layer to show the location of furniture, another to show carpets and rugs, and another to show lamps. You can selectively show and hide layers to examine one detail or show the big picture. And because many drawings involve reusing the same shapes or symbols — chairs, bathroom fixtures, doors, windows — most drawing programs provide *symbol library* features that let you store and retrieve often-used shapes.

Adobe Illustrator, Aldus FreeHand, and MacDraw Pro approach drawing from the standpoint of a graphic designer or technical illustrator, not a draftsperson. The technical illustrations you see in *Macworld* and in this book (such as Figure 13-2



Pencils

Variant: Sharp Pencil

Penetration 24%

Concentration 69%

Method: Grainy Hard Buildup

Figure 13-5: Painting with Painter Fractal Design's Painter is designed to electronically re-create the tools and techniques of traditional painting. With the brush palette shown here, you can customize the operation of Painter's tools.

"Bitmaps Versus Objects") are produced using FreeHand or Illustrator. You won't find automatic dimensioning features in these programs, but you will find features geared toward the production of technical illustrations, package designs, and advertising art.

Putting a Graphics Program to Work
#7: Make a poster

Most draw programs can print poster-size drawings by tiling — printing sections of the drawing on individual pages that you attach to each other. You can use this feature to create large posters — up to 81 square feet in Canvas.

QUICK TIPS

Putting a Graphics Program to Work

#8: Create a publication

With their rulers, line-drawing tools, and alignment features, draw programs make serviceable publishing programs, especially for small jobs such as brochures or one-page fact sheets. Canvas and MacDraw even have spelling checkers. Integrated programs such as ClarisWorks and Microsoft Works are particularly well-suited to basic publishing, especially if your publications require graphs or data from a spreadsheet or database. Both programs (as well as Adobe Illustrator) let you link text blocks and flow text across multiple columns.

You'll also find extensive text-manipulation features and options for taking advantage of PostScript's printing prowess. For example, FreeHand, Illustrator, and MacDraw Pro can all create *graduated fills* — patterns in which one shade smoothly blends in to another. (The shading that appears in many of the illustrations in this book is a graduated fill.)

Illustrator introduced the Macintosh world to Bezier curves — a method of describing the path that a digital pen travels as it inscribes lines, curves, and shapes (see Figure 13-6 "How Bezier Curves Work"). When Illustrator debuted back in

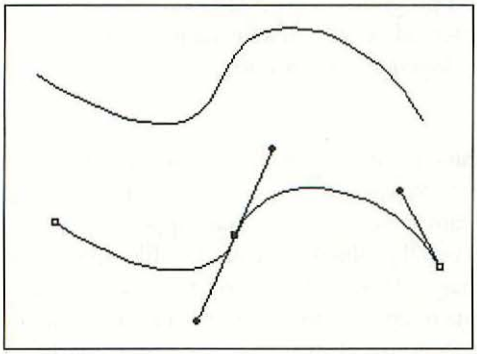


Figure 13-6: How Bezier Curves Work The shape of a Bezier curve (top) is determined by its control points (bottom). By dragging the control points, you can reshape the curve. Imagine the curve as a piece of soft wire, and each control point as a nail around which the wire is wound.

1987, critics claimed its method of drawing curves was too complex. History and the marketplace have proven them wrong, as almost all current illustration programs use the Bezier technique.

For many illustration jobs — product packaging, advertisements, company logos — type is just another form of graphic. Illustrator, FreeHand, and Deneba's Canvas also let you dissect Type 1 and TrueType printer font outlines to break characters down into their individual curves and lines. After converting a font into outlines, you can reshape characters — perhaps to create a company logo or package design. Illustrator lets you create linked text blocks and flow text across multiple columns as if you were using a publishing program. Illustrator 5 even provides automatic hyphenation features.

All three programs can also bind text to an arbitrarily shaped path — handy for printing text in a circle on the label of a compact disc, for example. Some of the Step-by-Step boxes in this chapter show how to create these and other popular special text effects.

Mixed Media

Fortunately, choosing between paint and draw graphics isn't an either/or proposition. Programs such as Deneba's Canvas and Aldus SuperPaint provide both painting and drawing features. You can also move images between separate paint and draw programs using the Clipboard. You might paste a bitmapped image into a drawing program to annotate it with text. You can also paste an object-oriented drawing into a bitmapped program, but it becomes just another bitmap floating in a sea of pixels.

Several drawing and illustration programs also provide *autotrace* features that enable you to create an object-oriented version of a bitmapped image. For example, you might scan your corporate logo and then autotrace the resulting bitmapped image.

And remember, you can combine paint or draw programs with other types of software. You can use the Clipboard to paste images into word processors, page-layout programs, data managers, and any other program that supports graphics. Because images can be large, however, you'll probably rely on disk files instead of the Clipboard to import and export images. If you take this route, familiarize yourself with Macintosh graphics-file formats to choose the one that will represent your image accurately and take up the least amount of storage space (see Table 13-1).

Putting a Graphics Program to Work

#9: Create a presentation

MacDraw II, MacDraw Pro, and ClarisWorks 2 provide features for creating overhead transparencies and slides. MacDraw Pro and ClarisWorks 2 also provide features for giving a presentation. You can, for example, specify special visual effects for slide transitions, such as a wipe, in which one image is pushed off the screen by another. A ClarisWorks 2 presentation can even contain QuickTime movies. If you give presentations on a regular basis, you'll probably be better served by a program such as Aldus Persuasion or Microsoft PowerPoint (both are covered in Chapter 16). But if you're an occasional presenter, a drawing program may be all you need.

Table 13-1

Storing Pictures

Format	*Best for*	*Comments*
EPS	Text and bitmapped or object-oriented graphics to be printed on a PostScript printer	Widely supported in both Mac and PC worlds. Generally used to export images from PostScript drawing programs or scanning applications to desktop publications.
GIF	Bitmapped images	Developed by CompuServe for exchanging graphics between different systems. Allows up to 8 bits per pixel. GIF translators are available for most computers.
JPEG	Bitmapped images	Uses compression to reduce storage requirements.
MacPaint	72-dpi bitmapped images	Widely supported, even by some DOS PC graphics and publishing programs.
PICT	Bitmapped or object-oriented graphics	Usually used to transfer object-oriented graphics between programs.
PICT2	Bitmapped or object-oriented graphics	A newer version of the PICT format that supports color.
RIFF	Bitmapped images, especially scanned	Developed by Fractal Design and used by ImageStudio and ColorStudio. Supported by QuarkXPress and DesignStudio, but not by PageMaker or many other graphics programs. Files are usually smaller than TIFF counterparts.
TIFF	Bitmapped images, especially scanned	Widely supported in both Mac and PC worlds. Able to represent color and gray-scale images at virtually any resolution. Files can be large.

QUICK TIPS

Putting a Graphics Program to Work

#10: Modify clip art

Many companies sell libraries of canned illustrations that you can use in desktop publications. Instead of just using a clip art drawing as is, copy it to a graphics program and personalize it — add some shading, slant it using a shear tool, or flip it horizontally. You can also autotrace a bitmapped clip art image to improve its appearance.

Picto Graphs

Future archaeologists may be unable to decipher our written languages, but at least they'll have pie charts to learn where our tax dollars went. Charts and graphs from spreadsheet and graphics programs like Microsoft Excel, Claris Resolve, and Lotus 1-2-3 have become the hieroglyphics of our time. Printed as-is or spruced up with a drawing program, they provide at-a-glance insights into tables of yawn-worthy numbers.

Graphing programs require data in tabular form, which is one reason why they're often paired with spreadsheets and integrated programs. The combo works well: You can select a row of data, perhaps final sales figures for the past four quarters, choose a command or two, and the program creates a chart. Each value is a *data point;* together, a set of values is a *data series.* The column headings act as *category names,* which, in a bar chart, appear below their corresponding bars.

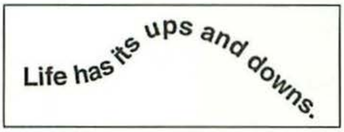
You can create additional data series — perhaps to contrast this year's sales figures with last year's — by using more than one row of values. In such cases, you'll probably add a *legend* — a box adjacent to the chart that shows category names alongside the patterns in which their data points appear.

Integrated graphing programs

Although you usually find graphing features in spreadsheet and integrated programs, they do pop up elsewhere. Adobe Illustrator can create graphs, and one word processor, Microsoft Word, includes a graphing program. It's called — can you guess? — Microsoft Graph, and it can generate a graph based on data contained in a Microsoft Word table (there's that close relationship between tables and graphs again).

Text on a Curved Path in FreeHand and Illustrator

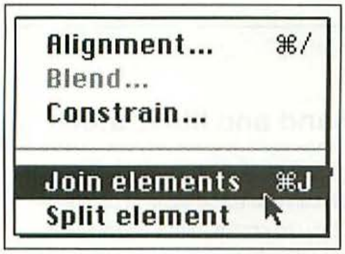
A common text effect involves attaching a line of text to a wavy baseline. The instructions in this box show you how to bind text to a curved path using Aldus FreeHand and Adobe Illustrator.


Life has its ups and downs.

To bind text to a curved path in FreeHand:

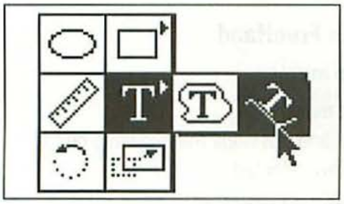
1. **Press and hold the Shift key, select a text box, and then select the path to which you want to bind the text.**
2. **Choose Join elements from the Element menu or press ⌘-J.**

   FreeHand joins the text.



Other tips for binding text to a curved path include the following:

- ❖ You can fine-tune the way the text is joined by selecting it and choosing Element Info (⌘-I) from the Element menu. See the FreeHand manual for details.
- ❖ Selecting text that you've bound to a curved path can be tricky. The easiest way to do so is to draw a selection marquee around part or all of the text.



To bind text to a curved path in Illustrator:

1. **Create the path.**
2. **Select the path-type tool (highlighted at left).**
3. **Position the pointer on the path and then click the mouse button.**

   A blinking insertion point appears on the path.
4. **Type the text.**

   Illustrator automatically positions the text along the path as you type.

   You can move the text along the path by selecting the text, pointing to the large I-beam at the beginning of the line of text, and then dragging.

Microsoft Graph also supports the Microsoft OLE data-exchange system: Double-click a graph that you've inserted in a Word document, and Word automatically starts Graph, which opens the graph. Make your changes and close the graph, and the new version appears in your document. (See Chapter 28 for more details on OLE.) Microsoft Graph doesn't have all the graphing features of Microsoft Excel, but it does use far less memory, making it more practical to run Graph and Word simultaneously.

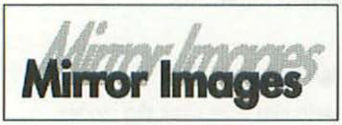
Industrial-strength graphics

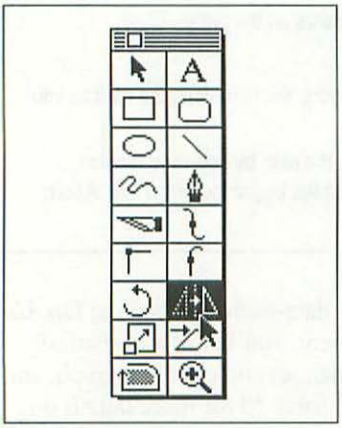
For industrial-strength graphics features, check out Computer Associates' CA-Cricket Graph III. The latest version of this veteran graphing package is laden with drawing and text-annotation features — ideal for creating presentation materials. Cricket Graph III provides a built-in data sheet into which you can paste row-and-column data that you want to graph. Or, use the program's publish and subscribe features to link to a spreadsheet such as Microsoft Excel. Another powerhouse graphing program is DeltaPoint's DeltaGraph Professional, which has presentation-oriented features that even let you attach sounds and QuickTime movies to the graphs you create.

STEP-BY-STEP

Using Mirror and Shadow Effects in FreeHand and Illustrator

Both FreeHand and Illustrator provide tools that let you skew or distort part or all of an image. In FreeHand, it's called the skewing tool; in Illustrator, it's the shear tool. You can use these tools to create mirror-image or shadow effects. The instructions in this box show you how to create mirror and shadow effects using FreeHand and Illustrator. I've used a text block for these examples, but you can substitute any type of object — a shape you've drawn, a piece of clip art, or even a scanned image that you've imported.





To create a mirror effect in FreeHand:

1. **Select the item you want to mirror.**
2. **Choose Clone from the Edit menu.**
   FreeHand duplicates the item and positions the duplicate on top of the original. The clone is now selected.
3. **Activate the mirror tool (highlighted at left).**
4. **Press and hold the Option key while clicking the object.**
   The Reflect dialog box appears.
5. **Select the Horizontal option and click OK or press Return.**
   The clone now appears upside down.
6. **Activate the selection tool (the arrow) and drag the clone down so that its top just touches the original object.**

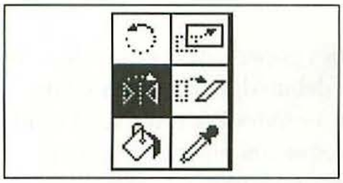
Notes to keep in mind when creating mirror effects in FreeHand include the following:

- To change the angle of the reflection, use the skewing tool.

(continued on the next page)

(continued from the previous page)

- To make the reflection look more realistic, you may want to change its fill pattern to a lighter shade than the original object. If you're working with text, use the Fill and Stroke command in the Type menu's Effect submenu. If you're working with an object, use the Fill and Line command in the Attributes menu.



To create a mirror effect in Illustrator:

1. **Select the item you want to mirror.**
2. **Duplicate the item by pressing the Option key while dragging the item.**

   As an alternative, you can choose Copy, and then Paste. This, however, replaces the Clipboard's previous contents.
3. **Double-click the reflect tool (highlighted at left).**

   The Reflect dialog box appears.
4. **Select the Horizontal Axis button, and then click the OK button.**

   Illustrator reflects the selected item.
5. **Fine-tune the duplicate's position if necessary.**

Notes to keep in mind when creating mirroring effects in Illustrator include the following:

- To change the angle of the reflection, use the shear tool.
- To make the reflection look more realistic, you may want to change its fill pattern to a lighter shade than the original object. Use the Paint menu's Style command. If you're working with text, use the Fill and Stroke command in the Type menu's Effect submenu. If you're working with an object, use the Fill and Line command in the Attributes menu.

Computer Aided Design — Drafting on the Mac

This is not a good time to be in the T square manufacturing business. Computers are replacing traditional drafting tools in the same way that word processors are supplanting typewriters. A detail-minded category of drawing program, computer-aided design (CAD) software can turn computers into electronic drafting tables that make it easier than ever to create and revise complex drawings.

CAD was born in the sixties, when some automobile and aircraft manufacturers began augmenting their pencil-and-paper drafting methods with floor-sagging mainframe computers tied to large graphics terminals. These systems — which had a fraction of the Mac's speed, memory, and graphics resolution — cost millions of dollars to buy and hundreds of dollars an hour to run. Because of their cost, CAD systems' benefits were reserved for the designers of such complex beasts as cars, planes, and missiles. Everyone else used T squares, triangles, mechanical pencils, compasses, and protractors.

As the cost of computers shrank and their capabilities grew, CAD became feasible for smaller firms. Shortly after personal computers debuted, CAD appeared on desktops, thanks largely to two DOS PC programs — Autodesk's AutoCAD and VersaCAD Corporation's VersaCAD. The Mac, despite its superior graphics, wasn't part of the picture. Using the original Mac's 9-inch screen to view blueprint-size CAD drawings would be like viewing the ceiling of the Sistine Chapel through a keyhole.

Today, thanks to large-screen monitors and fast Macs, the Macintosh is becoming a force in personal computer CAD. What follows is a beginner's guide to the jargon and concepts behind Mac CAD — a starting point for your own investigation.

Categories of CAD

CAD programs are object-oriented drawing programs on steroids. Like the lowly (and far more practical for most people) MacDraw, CAD programs provide tools for drawing shapes and they provide commands for altering those shapes and displaying their dimensions. You can also create boilerplate designs and adapt them as needed. Fast-food chains, for example, use CAD programs to adapt their basic building designs to specific sites, allowing their buildings to maintain that "Anytown, USA" look while still adapting to the characteristics of a specific site. Three basics categories of CAD exist — mechanical, architectural, and electrical engineering.

Mechanical CAD

Mechanical CAD is the broadest category. It involves the design of objects — cars, planes, trains, machine parts, lamp shades, thumbtacks, you name it. Most mechanical CAD programs create two-dimensional drawings that, like soap opera characters, have height and width, but no depth.

Architectural CAD

Architectural CAD, as you'd guess, involves the design of buildings. Architects create many kinds of drawings — elevations depicting a building's profile; floorplans showing room dimensions, door locations, and furnishings; and maps of the building's plumbing, heating, and electrical systems. Many CAD programs provide drawing tools for creating parallel lines, making it easy to draw walls. Some architectural CAD programs let you create a 3-D view that you can rotate and examine from different angles.

Electrical engineering CAD

Electrical engineers use CAD programs to design circuits and schematics — those symbols and lines that show how electronic components are interconnected. CAD programs designed specifically for circuit design are often called *schematic capture programs.* In addition to letting you easily draw a schematic diagram, these programs work behind the scenes to keep track of what's connected to what. When you're finished, you have not only a schematic drawing, but a parts list and a list of connections. That list of connections can go to a circuit board layout program such as Douglas CAD/CAM Professional System, which can map out the copper highways and byways that traverse a multilayer printed-circuit board.

CAD and computer-aided manufacturing (CAM)

At this advanced level, CAD programs play a direct role in executing a design. Many programs can shuttle their data directly into computer-aided manufacturing (CAM) equipment, which uses the measurements and specifications in the CAD drawing to control industrial robots or machining tools to create the parts in the drawing. Such Buck Rodgers CAD/CAM is primarily the province of six-figure workstations.

Life with a CAD Program

If you suspect software with this kind of power is complex, you're right. Forget diving into a CAD program without opening the manual. You need days or weeks of practice to master the hundreds of drawing, measuring, and annotating features that a powerhouse CAD program provides.

Similarities to drawing programs

If you use any version of Claris' MacDraw, you have a head start. From the features standpoint, MacDraw is to a CAD program what a tricycle is to a Harley-Davidson. But there are similarities in their basic approaches to electronic drafting.

You begin with a blank, untitled document window, and create a drawing by choosing tools from on-screen palettes, using the mouse to draw shapes.

To help you draw straight lines and position objects accurately, most drawing programs provide a snap-to feature that causes the mouse pointer to be drawn to an invisible grid as it moves. But CAD programs offer more ways to snap. For example, most programs let you specify that an object snap to a particular point on another object, or to the point where two objects intersect.

A powerful array of specialized tools

MacDraw provides tools for drawing several different shapes, but a CAD program's palettes bristle with specialized tools that make creating complex drawings easier. A CAD program's *geometric facilities* replace compasses and protractors and enable you to quickly draw objects requiring calculations or measurements. Need to measure an angle or calculate the midpoint of a line? Want to draw a line perpendicular to a slanted line, parallel to it, or tangent to an arc (such as a belt connecting two pulleys)? Such chores are a common part of an engineer's or architect's life. A CAD program reduces them to a mouse click.

CAD programs also simplify altering the objects you draw. As with MacDraw, you can move or resize an object by selecting it and dragging the mouse. Many CAD programs also let you enter measurement or position values from the keyboard for greater precision. Most programs also provide on-screen rulers and *coordinate windows* that display the mouse pointer's position as it moves within the drawing window.

Chamfers and fillets

A more advanced level of object altering involves creating chamfers and fillets. A *chamfer* is a beveled corner formed by a diagonal line that connects two lines. If you chamfer all four corners of a box, you get an octagonal shape similar to that of a stop sign. A *fillet* (pronounced fill-it) is similar, except the object connecting the two lines is an arc, not a diagonal line. If you fillet all four corners of a box, you get a box with round corners or, if the arcs are large enough, a circle. Geometrically speaking, a fillet is an arc tangent to two objects.

Other Labor-Saving Features

CAD programs also give you more ways to tame complex drawing jobs. One such life simplifier that nearly all CAD programs provide is a layering feature similar to that of many draw programs. Engineers and architects often build drawings using layers of transparent acetate, each showing a particular component or system. An architect might show a plumbing system on one layer, walls on another, electrical systems on a third, and room dimensions on a fourth.

CAD layering features

CAD layering features work similarly. You can move objects between layers and selectively show and hide layers, depending on how much detail you want to see. You can assign a color to each layer to color code the systems in a drawing. Many CAD programs also let you open bitmapped graphics and place them on one layer, and then trace over them using the CAD program's tools. You could use this technique to transfer old blueprints or schematics into a CAD program: First digitize the images using a scanner, and then import them and trace over their bitmaps.

Dimensioning features

Mechanical drawings and architectural blueprints always show the dimensions of their components. CAD programs provide dimensioning features that create those dimension values for you. Simply choose a command or click a palette icon, select the item you're measuring, and the CAD program adds the dimension to the drawing, complete with arrows and lines. All programs that provide dimensioning features let you choose the measuring system in which dimensions appear, and many also let you choose from several styles of arrows and extension lines. Most programs that provide dimensioning also provide *auto-dimensioning*. When an auto-dimensioning feature is active, the program changes dimension values for you when you change an object's size.

The kinds of objects you can measure vary between programs. Some programs provide only *linear dimensioning* — measuring the distance between two points. Others also support *angular dimensioning* — measuring the size of angles. Still others go a step further, offering *radial dimensioning* — the ability to measure the radii of circles.

CAD symbol libraries

Drawings and schematics often contain multiple copies of the same object, be it a bolt, a sink, or a transistor. Most CAD programs offer symbol libraries that make it easy to create, store, and reuse often-used symbols of your trade. Some programs come with libraries of common architectural or electronic symbols.

Libraries can also be extra-cost options available from the program's developer or from third parties. With many programs, you can assign a name to each symbol, such as "3-inch carriage bolt" or "conference chair." Some programs can use those names to print parts lists showing how many times a given component appears in a drawing, enabling you to easily generate a parts list and bill of materials. This feature is often called *attribute tracking* or *associativity.* High-end CAD programs can often export these lists to database managers.

Zoom and redraw halting

And because even a large-screen monitor can't show an entire blueprint-size drawing at actual size, all CAD programs offer zoom commands that let you move in for a close-up look or zoom out to get the big picture. Redrawing an image containing thousands of objects can also take time, even on the higher-end Macs. To eliminate the wait, most programs offer a *redraw halting* feature that lets you stop the redrawing process. You might use redraw halting to stop further redrawing after the object you've zoomed in to see appears.

Exchanging and Printing

If you work in an organization that already uses a CAD system — whether a large workstation or a DOS PC — you may want to investigate the data-exchange options that Mac CAD programs provide. There is no single standard for moving CAD drawings between systems, but there are some established formats. Perhaps the most popular is IGES, short for Initial Graphics Exchange Standard, developed by the American National Standards Institute (ANSI). You'll find support for IGES files in CAD systems running on micros, minis, and mainframes. Another popular format is the DXF file, popularized by Autodesk's AutoCAD package for DOS PCs.

Some Mac CAD programs can import and export IGES and DXF files. With others, file-translation modules are extra-cost options. Most advanced CAD users have come to rely on translation programs such as Claris Graphics Translator or Kandu Software's CADMover, both of which can translate between IGES, MacDraw, PICT, DXF, and many other formats.

Plotter output

A CAD drawing's final destination is a piece of paper, and some CAD programs can get it there in more ways than others. In the CAD world, the dominant output device isn't a LaserWriter or an ImageWriter but a pen plotter, which prints by zipping special felt-tipped pens across a sheet of paper or mylar film. Most plotters can hold between 4 and 12 different colored pens in a turret mechanism, switching between them as instructed by the CAD program.

Plotters are often described according to their maximum paper size, with each size labeled by a letter: An A-size plotter can create 8 ½ by 11-inch drawings, B-size drawings measure 11 by 17; C-size 17 by 22, D-size 22 by 34, and E-size 34 by 44. Nearly all Mac CAD programs can print to a plotter and support plotters from such industry leaders as CalComp, Hewlett-Packard, Houston Instruments, and Roland.

Plotters take too long to accurately render the subtle serifs and fine details of Mac fonts, so most CAD programs with plotter support include *stroke fonts* for their output. Stroke fonts enable the plotter to quickly draw text using — you guessed it — single strokes of its pens. Stroke fonts, sometimes called *vector fonts*, resemble the letters created with a Leroy lettering set, a stencil lettering kit popular in the drafting world.

CAD output options

Mac CAD programs also support ImageWriters and LaserWriters, but to varying degrees. Some can print in only low-resolution draft modes, but most offer both low- and high-resolution ImageWriter and LaserWriter output. Low-resolution output is useful for producing quick proofs of a drawing. High resolution takes longer, but takes advantage of your printer's maximum resolution.

Another output option is a large-format ink jet printer such as GCC Technologies' WideWriter 360. The WideWriter provides large-format output in a reasonably priced package, thanks to a Canon-built ink jet print mechanism that's conceptually similar to that of Apple's StyleWriter inkjet printer. Like a StyleWriter, the WideWriter 360 provides print resolution of 360 dots per inch (dpi) and uses a disposable ink cartridge.

Unlike the StyleWriter which is limited to legal-size sheets, a WideWriter can automatically feed sheets as large as 14 by 91 inches. Using the manual-feed slot, you can print sheets of up to 17 inches wide, with no length limitation. You can also load the WideWriter with continuous-feed fanfold paper to print ultra-wide documents.

The Cost of CAD

If you're drooling at the prospects of working CAD into your life, dry up — at least until you check your bank balance. Software with the capabilities I've described doesn't come cheap.

To get satisfying performance from a CAD program, you need at least a Mac II-class machine with several megabytes of memory — a Quadra or accelerated Mac wouldn't be overkill. If you'd prefer to spend your time drawing rather than scrolling, you'll want a large-screen monitor, too.

The hard facts of software costs

Then there's the cost of the programs themselves. Their complexity and a relatively small market combine to place CAD programs among the Mac's most expensive software. High-end CAD programs such as Gimeor's Architrion II, Autodesk's AutoCAD, and InterGraph Corporation's MicroStation Mac each cost over $3,000. Between $1,000 and $3,000, you can find programs such as Ashlar Vellum, Schlumberger's MacBravo Detailer, and IGC Technology's Pegasys II, to name only a few.

You can also get capable programs for less than $1,000. Examples include Claris' Claris CAD (one of the most popular Mac CAD packages), Engineered Software's PowerDraw, VersaCAD's VersaCAD Drafter, Forthought's Snap, and Graphsoft's MiniCad+. But be aware that some programs in this under-$1,000 ballpark don't include the plotter support and file-exchange features included with their higher-priced brethren. If you need those features, be sure to tally up the total cost before buying.

Mac CAD at affordable prices

The most reasonable CAD programs are Autodesk's Generic CADD Level 1, Graphsoft's BluePrint, and Abracadata's Design Your Own Home Architecture, all of which retail for less than $300. These programs can't match the capabilities of an AutoCAD or Architrion II, but they're ideal tools for exploring the CAD world. And if you outgrow them, chances are you'll be able to import their drawings into a more powerful program.

Choosing the program that suits your needs

Besides the features I've described here, other factors may influence your choice in a CAD program. For example, if you need to exchange drawings with DOS PCs, you can get more consistent results with a program that has a PC counterpart, such as AutoCAD. If you've used Schlumberger's Bravo on a Digital Equipment Corporation VAX minicomputer, you'll feel comfortable with MacBravo. If you're buying CAD software that will be used by people with varying levels of CAD experience, a mid-range product such as Snap, Claris CAD, or PowerDraw may be in order. And don't forget to match the program's appetite for hardware to the systems you have. Try to run a high-end CAD program on a mid-range Mac, and you'll be disappointed with the results.

Picasso Hated Mice

If you're serious about any form of electronic art, you might consider supplementing your mouse with a graphics tablet, such as Wacom's UD-0608. Graphics tablets have a flat surface (usually 12 by 12 inches or thereabouts) upon which you draw using a pencil-like stylus (see Chapter 34). The Wacom tablet is especially appealing: Its wireless stylus responds to pressure. When used with a paint or draw program that supports it, you can press harder and get darker or wider lines. (Programs that support Wacom pressure-sensitive tablets include Adobe Photoshop and Illustrator and Aldus FreeHand.) Many artists and CAD devotees find graphics tablets more natural than the mouse for drawing and tracing. (Graphics tablets and other alternative input devices are discussed in Chapter 34.)

But beware — if you think graphics programs are appealing when used with a mouse, wait until your friends start scribbling with a stylus. They may never go home.

CHAPTER 13 CONCEPTS AND TERMS

- Bitmapped, or paint, programs store images as a series of bits, one (or more) for each pixel in the image. Paint programs are best for creating subtle shading effects and for manipulating scanned images.
- Object-oriented, or draw, programs store images as a series of instructions for QuickDraw or PostScript. An object-oriented image can take full advantage of your printer's resolution. Draw programs are best for creating technical illustrations, blueprints, electronic schematics, organizational charts, and other forms of line art.
- Computer-aided design, or CAD, programs are sophisticated draw programs that provide features for measuring objects, creating multilayer drawings, and tracking the materials required for a project.
- Some programs, including Aldus SuperPaint and Deneba's Canvas, combine drawing and painting features.

attribute tracking
Also called *associativity*, a CAD program feature that enables you to generate a parts list and bill of materials based on the objects you've drawn.

autotrace
A drawing program feature that automatically traces a bitmapped image and generates an object-oriented version of it.

Bezier curve
A method of describing the path that a digital pen travels as it inscribes shapes. You can reshape the path by dragging one or more control points.

bitmapped image
An image in which each dot, or pixel, corresponds to a bit in the Mac's memory. With a monochrome (black and white) bitmapped program, a bit with a value of 1 creates a black dot, while a bit with a value of 0 creates a white dot. Gray-scale or color bitmapped programs assign multiple bits to each pixel — the bits' on-off combinations indicate the pixel's gray shade or color.

chamfer
A beveled corner formed by a diagonal line that connects two lines. If you chamfer all four corners of a box, you get an octagonal shape similar to that of a stop sign.

coordinate window
A window that displays the mouse's position as you move it.

data point
A single value — such as the sales results for one quarter — in a graph such as a bar chart.

data series
A set of related values — such as the sales results for an entire year — in a graph.

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dimensioning
A feature provided by many draw programs for adding measurements to a drawing by clicking the objects you want to measure. Most draw programs provide *linear dimensioning* — measuring the distance between two points. CAD programs often add *angular dimensioning* (measuring the size of angles) and *radial dimensioning* (measuring the radii of circles).

dithering
A technique of simulating gray shades or colors through the use of patterns.

draw program
A term often used to describe an object-oriented graphics program.

fillet
Pronounced *fill-it,* an arc tangent to two objects. If you fillet all four corners of a box, you get a box with round corners or, if the arcs are large enough, a circle.

geometric facilities
The features in a CAD program that enable you to draw objects requiring calculations or measurements.

graduated fill
A pattern in which one shade smoothly blends in to another.

graphics tablet
A mouse alternative that provides a flat surface on which you scrawl with a pen-like stylus.

image processing program
A program that works with bitmapped images and is primarily designed for retouching and otherwise modifying scanned or video-captured images.

layering
A feature that enables you to divide an image into multiple layers, each of which acts like a see-through plastic overlay. You can selectively show and hide layers to examine one detail or show the big picture. Layering features are most commonly found in draw programs.

legend
In a graph (such as a bar chart), a box adjacent to the chart that shows category names alongside the patterns in which their data points appear.

object-oriented image
An image comprised of discrete objects, such as lines, circles, arcs, rectangles, and free-form paths. An object-oriented image requires less memory to store than a bitmapped image and is resolution independent — that is, not tied to a specific number of dots per inch.

paint program
A term often used to describe a bitmapped graphics program.

pen plotter
A type printer, popular in the CAD world, that produces output by zipping special felt-tipped pens across a sheet of paper or mylar film.

pixel
Short for *picture element,* a single dot on the Mac's screen.

redraw halting
A time-saving feature that enables you to interrupt a program while it's drawing a complex image.

schematic capture program
Another term for a computer-aided design program designed specifically for circuit design.

snap-to grid
A drawing program feature that helps you draw straight lines and position objects accurately by causing the mouse pointer to be drawn to an invisible grid as it moves.

stroke font
Also called a *vector font,* a type of simple font provided by many CAD programs.

symbol library
A drawing program feature that enables you to store and recall often-used shapes, such as chairs, bathroom fixtures, doors, or windows.

CHAPTER FOURTEEN

Image Processing

IN THIS CHAPTER

- Combining photography with computers in the electronic imaging revolution
- Defining gray maps, histograms, masks, gamma correction, and other image processing jargon
- Outfitting an electronic darkroom
- Creating special effects by combining and filtering images
- Working faster in Adobe Photoshop

Photography is going electronic, and the Mac is helping to take it there. Conventional film and processing techniques haven't yet gone the way of the daguerreotype, but more and more publishers, photographers, designers, and scientists are relying on computers to help them publish, retouch, and analyze images. Electronic imaging can be faster and more flexible than conventional photography, and it's environmentally sound, with no chemicals, silver halides, and other toxics required.

The techniques behind electronic image manipulation are called *image processing*, and they're the subject of many technical, and even ethical and legal discussions. Image processing hardware and software can be complex and costly, especially where color images are concerned. Ethical questions arise when a photo's content is altered. The common view of photography as a realistic medium is shattered when you learn that news, police, or spy satellite photos can be changed with a few mouse clicks. And legal issues surface when designers and artists use portions of copyrighted images in their works.

In this chapter, I'll introduce the basic concepts behind image processing and the hardware and software it requires. I'll also examine some advanced image processing and printing concepts, and provide some tips for the Mac world's most popular image-processing program, Adobe Photoshop.

Image Processing Applications

ON THE CD

- Adobe Photoshop
- Aldus Digital Darkroom
- Aldus Gallery Effects Sampler
- Fractal Design Sketcher and Painter
- Numerous sample images

Before delving into the technicalities behind image processing, I'll introduce you to those who can benefit from the technology.

- *Publishers and photographers* These folks often need to crop, retouch, and otherwise alter photographs. Image processing software lets them erase scratches and blemishes, remove distracting backgrounds, or improve contrast and brightness. It also offers a safety net no airbrush or retouching pencil affords — an Undo command.

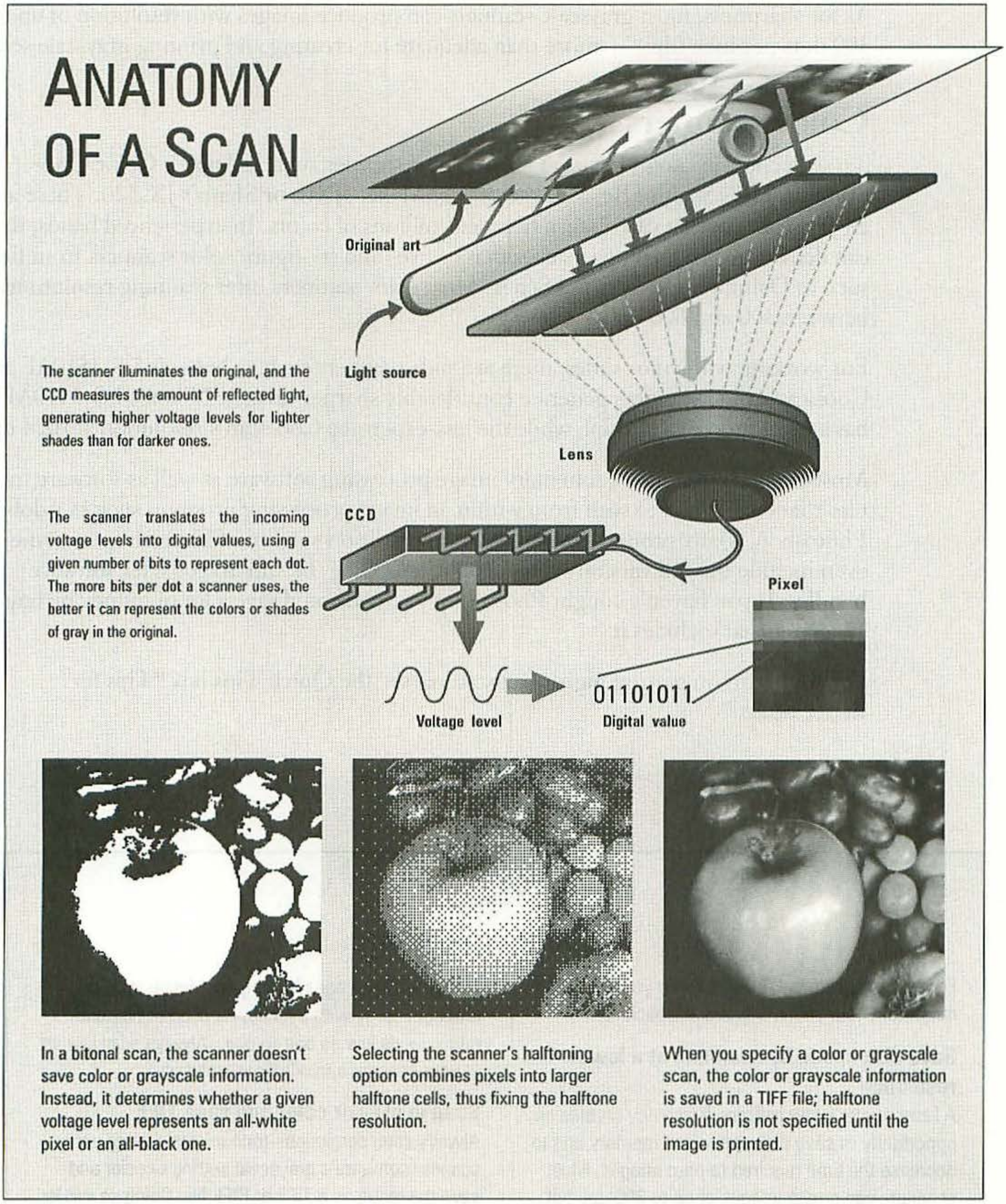
- *Publishers and printing companies* Getting full-color images into print involves performing two important steps. *Color correction* involves tweaking the hues in an image for greater realism. *Color separation* is the process of dividing a color image into four separate images, one each for cyan, magenta, yellow, and black — the four *process colors* that printing presses combine to print color images. Until recently, the Mac wasn't involved in this upper stratum of imaging; now it's a major player.
- *Illustrators, designers, and artists* Image processing software helps these individuals create special effects that would otherwise require hours of darkroom work or couldn't be done any other way. Some programs can even make an image look like it was painted in a pointillist style.
- *Scientists and educators* These professionals use image processing software to enhance and emphasize important details — the walls of a cell, for example, or a tumor in an X-ray. In factories, specialized image processing hardware and software guide industrial robots and check that circuit board parts are installed correctly. And those planetary portraits phoned home by the Voyager space probes wouldn't be nearly as impressive were it not for image processing specialists at the Jet Propulsion Laboratory.

Turning Pictures into Pixels

Before you can bring an image processing program's powers to bear, you need images. While some people use image processing programs to create original artwork, most work with images generated by a variety of hardware add-ons. The most popular are scanners, those cousins to copiers that take photographic prints or slides and translate them into a series of gray or colored dots (see Figure 14-1 "Anatomy of a Scan").

Gray-scale scanners

For scanning black and white photographs, you need a grayscale scanner such as Apple's OneScanner or Hewlett-Packard's ScanJet IIp. These are 8-bit scanners, capable of discerning roughly 256 levels of gray. Many older scanners (including Apple's original Apple Scanner) were of the 4-bit variety, capable of detecting only 16 levels of gray. These older scanners deliver inferior results when used with continuous tone images such as photographs.



ANATOMY OF A SCAN

The scanner illuminates the original, and the CCD measures the amount of reflected light, generating higher voltage levels for lighter shades than for darker ones.

The scanner translates the incoming voltage levels into digital values, using a given number of bits to represent each dot. The more bits per dot a scanner uses, the better it can represent the colors or shades of gray in the original.

In a bitonal scan, the scanner doesn't save color or grayscale information. Instead, it determines whether a given voltage level represents an all-white pixel or an all-black one.

Selecting the scanner's halftoning option combines pixels into larger halftone cells, thus fixing the halftone resolution.

When you specify a color or grayscale scan, the color or grayscale information is saved in a TIFF file; halftone resolution is not specified until the image is printed.

Figure 14-1: Anatomy of a Scan

As for sharpness, most grayscale scanners can produce images with resolution of up to 300 dots per inch (dpi) — more than adequate for creating and printing grayscale scans.

Color scanners

To scan color photographs, you need a color scanner such as Apple's Color One-Scanner, HP's ScanJet IIc, Microtek's ScanMaker IIXE, or Sharp's JX-320. These are 24-bit scanners that can discern between millions of colors. In experienced hands, they can deliver quality that approaches that of five- and six-figure color scanners from firms such as Dainippon Screen and Scitex. Most color scanners offer scanning resolutions of between 300 and 600 dpi.

For working with color slides, there are slide scanners such as Nikon's LS-3510AF and Coolscan. Slide scanners generate considerably sharper images: Nikon's LS-3510AF has a resolution of 3175 dpi, while the less-expensive Coolscan's resolution is 1024 dpi.

Most scanners include rudimentary image processing software as well as software modules that enable you to scan from within an image processing program such as Adobe Photoshop. Many products include a limited-edition version of Photoshop — some even include the full version. When you're shopping, be sure to consider software bundles: If you haven't bought Photoshop yet, you could save a lot of money by buying a scanner that includes it.

For some tips on getting high-quality scans, see the Quick Tips box "Tips for Better Scans."

QUICK TIPS

Tips for Better Scans

Following two simple rules will help you get the most from your scanner and disk space.

Save disk space by scanning at a lower resolution

A laser printer's low halftone frequency creates an opportunity to save disk space and memory and to decrease the time required to print images. Most scanners can create images of up to 300 dpi, but scanning photographs at that maximum resolution wastes disk space. Generally, you can get excellent results by scanning photographs at a resolution twice the final halftone frequency — a 106-dpi scan for a 53-lpi halftone, for example, and a 240-dpi scan for a 120-lpi halftone. This is just a rule of thumb, however. For images lacking fine details, you can often get away with even lower scan-to-halftone ratios — as low as one-to-one. (Always scan line art at your scanner's maximum resolution.)

Scan in gray or color and save TIFF

Always scan continuous-tone originals using your scanner software's grayscale setting or color and save the result as a TIFF or RIFF file. Doing so will let you alter the image's grays or color balance, change its halftone resolution and angle, and resize the image without distorting its halftone screen. If you use the scanning software's halftoning options instead, the settings of these key components will be carved in stone during the scan.

Digitizing hardware

If your subject is at hand or on videotape, you can bypass the time and expense of photography with a video camera or an electronic photography system. Most camcorders and videocassette recorders have video-output jacks that you can connect to digitizing hardware. At the low end of the digitizer spectrum are products such as Digital Vision's Computer Eyes, which connects to the Mac's SCSI port (and, therefore, works with low-end machines such as Classics and Pluses).

For faster, higher-quality video digitizing, owners of Mac LC- or II-family machines can use a digitizing board such as SuperMac's VideoSpigot. These install in an expansion slot and have connectors for a camcorder or VCR. Accompanying software captures an image in as little as 1/60 second. Sometimes called *frame grabbers*, these boards are designed for multimedia applications (see Chapter 21).

Electronic photography

Photojournalists and others are embracing still video cameras that save images not on film, but in the camera's memory or on tiny floppy disks. Electronic photos currently lack the quality of conventional ones (they're gaining fast), but they don't require processing. They're ideal for newspapers and low-budget catalogs, service manuals, and newsletters. Canon makes the largest selection of still video cameras, whose retail prices start at about $1,500. Some models accept an optional floppy disk drive that stores images on tiny 2-inch floppy disks. Several other photographic equipment and electronics manufacturers, from Kodak and Nikon to Toshiba and Sony, have introduced similar products.

Dycam's Model 3 Digital Still Camera shoots and stores up to 32 grayscale images that you can transfer to the Mac over the phone lines or via a cable attached to the Mac's modem port. It's designed for applications that don't require color or the image quality of a still video system — documenting insurance claims, photographing real estate listings, or creating photo ID badges. Figure 14-2 "Electronic Snapshot," shows an image taken with the Dycam camera.

For a look at the other add-ons that you can find in a well-equipped image-processing setup, see the Background box, "Outfitting an Electronic Darkroom."

Kodak's PhotoCD System

One of the most exciting developments in the electronic imaging field comes from a company that has a bit of experience in conventional photography — Kodak. I'm referring to the Kodak PhotoCD system, which puts high-quality scans of conventional photographs on a CD-ROM disc.

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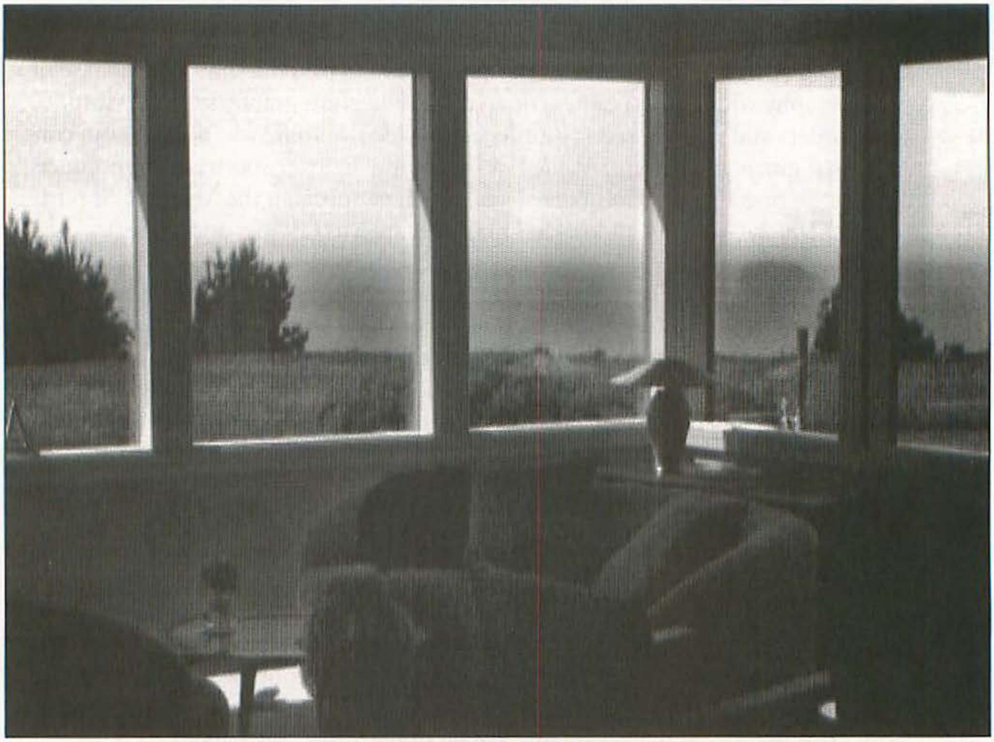

Figure 14-2: Electronic Snapshot This image was taken with the Dycam Model 3 electronic camera.

BACKGROUNDER

Outfitting an Electronic Darkroom

If you're fired up about image processing, a look at its cost may hose you down. You can perform simple image editing on a low-end Mac system, but day-in, day-out image processing requires a significant investment.

A color Mac

To get realistic grays and any color, you need a Mac capable of displaying them. Some image processing programs run on the monochrome Classic, SE, and Plus models, but these Macs must simulate shades of gray by dithering (combining patterns of dots), making detailed retouching and gray map adjustments difficult. Low-end Macs aren't fast enough for complex filtering and resizing tasks, either.

For realistic color, you need at least 16-bit color video circuitry. Most current color Macs support 16-bit color if you add a video memory upgrade. Better still is the 24-bit video built into the Quadra family and available through add-on cards for many other

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Macs. Throw in a large-screen monitor to avoid constant scrolling. (See Chapter 31 for details on video options.)

Color calibration hardware

Working with colors on the screen introduces a problem: A color monitor does not render the colors in the same way as a color printer or printing press. Color monitors create colors by adding red, green, and blue light in various ratios; printed output, on the other hand, creates colors by subtracting some colors and reflecting others. (In color jargon, monitors use an *additive* color model, while printed materials use a *subtractive* model.)

The answer? More hardware — specifically, color calibration hardware such as Radius' PrecisionColor Calibrator, SuperMac's SuperMatch Professional Color Matching System, or Kodak's ColorSense. A calibration device uses a small sensor cup that attaches to the screen surface of your monitor and provides feedback to the video board, which adjusts its signals to provide accurate on-screen colors. See Chapter 32 for details on color matching.

A CD-ROM drive

Besides wanting a CD-ROM to access Kodak PhotoCD discs (described earlier in this chapter), you may want one to tap the growing number of CD-ROM-based stock photo libraries. Stock photo libraries are the image processing world's version of clip art, offering scenes such as business, nature, sports, science, medicine, and more. Copyright and usage restrictions vary from product to product: With most libraries, you have to pay additional fees to use an image commercially. Sources for stock photo libraries include PhotoDisc, Inc. (Seattle, WA), Gazelle Technologies (San Diego, CA), and Comstock (New York, NY). Comstock also offers an on-line retrieval service for stock and news photography.

More incentive for purchasing a CD-ROM drive: Adobe offers a CD-ROM version of the Photoshop program that adds a stock photo sampler, additional filters and plug-in modules, technical notes, utilities, and a variety of Adobe typefaces (the Type on Call library, from which you can "unlock" typefaces by calling a toll-free number with credit card in hand).

Memory and disk space

Finally, you need to find room for all those bits that represent your images. A 5MB Mac is adequate for grayscale work, but 8MB of memory are better and are essential for color work. It isn't unusual to find dozens of megabytes of memory in an imaging professional's Mac.

As for hard disk space, you need it, too. A grayscale image can scarf half a megabyte in one sitting, and a large color file can consume ten times that. A 240MB drive is a bare minimum for grayscale work; you want at least twice that for color. Look for a fast hard drive, too: You spend less time waiting for files to open, save, and even appear on the screen. Serious image processors often supplement their hard drives with SyQuest or Iomega removable-media drives. (See Chapter 26 for storage shopping advice.)

Compression software

Another weapon against "disk full" messages is compression software such as Storm Technology's PicturePress. PicturePress uses compression routines built around a standard called JPEG, short for an industry organization called Joint Photographic Experts Group. Some image quality is lost in the compression process, although you can control the degree of compression to minimize that. PicturePress is also included with some DSP boards, including DayStar Digital's Charger, discussed later in this chapter.

You can also reduce storage requirements by using a general-purpose compression program such as Aladdin Systems' StuffIt Deluxe. And if you have Apple's QuickTime Starter Kit (discussed in Chapter 21), you can compress images using the Picture Compressor utility. This utility lets you choose the degree of compression to match the image quality you want.

Remember, too, that you can reduce disk requirements by simply learning how to fine-tune your scanner settings to obtain the best quality at the lowest possible scanning resolution.

Unlike still video cameras, PhotoCD supplements conventional film and processing instead of replacing it. (Kodak knows which side its bread is buttered on.) When you take a roll of 35mm film to a photo lab that provides PhotoCD services, you get not only your slides or prints and negatives, but also a CD-ROM containing scanned, color-corrected versions of the images.

A variety of resolutions and formats

The scans themselves are provided in a variety of resolutions — some for viewing images on the screen, others for high-quality publishing applications. The PhotoCD is enclosed in a standard plastic *jewel box;* the front cover of the jewel box contains a contact sheet that shows a small thumbnail version of each image. If you've been shoehorning your photos into shoe boxes, you're probably starting to get excited about the efficiency and convenience of electronic photo storage.

A PhotoCD can hold approximately 100 photos. Thanks to a special multisession CD recording technique, you don't have to fill the CD at one time. Simply take the CD back to the photo finisher when you drop off your next roll of film, and the lab will add the new images to the existing ones. You can also take the CD to a photo lab to have prints made from the digitized images — no holding negatives up to a window to determine which one you want to have reprinted.

Kodak also offers several PhotoCD options for professional photographers, such as PhotoCDs that store images from large-format, such as 70mm and 4 by 5-inch, cameras. *Pro PhotoCDs,* as they're called, can also incorporate three security features — a special identifier bearing copyright information, an encryption scheme that prevents unauthorized access to images, and an option that prints a watermark (such as the word *PROOF*) over an image.

PhotoCD players

Kodak sells a variety of PhotoCD players that can also play audio CDs. They're fine machines with some slick options such as the ability to zoom in on part of an image and to play images in a specific order. But Kodak's players attach to a television set, not a Macintosh. To work with PhotoCD images on a Mac, you need a CD-ROM drive that supports XA Mode 2, the special recording mode used to create multisession PhotoCDs. Most of today's CD-ROM drives support XA Mode 2. Apple's AppleCD 300 (and its internally mounted cousin, the AppleCD 300i) is among them, and includes software that lets you view PhotoCD images on the desktop (see Figure 14-3 "Accessing PhotoCD Images").

Some older CD-ROM drives that use Sony mechanisms can read the first session on a PhotoCD — that is, the first set of images that were recorded to the CD — but are unable to access subsequent sessions. Apple's now-discontinued AppleCD 150 is one such drive.

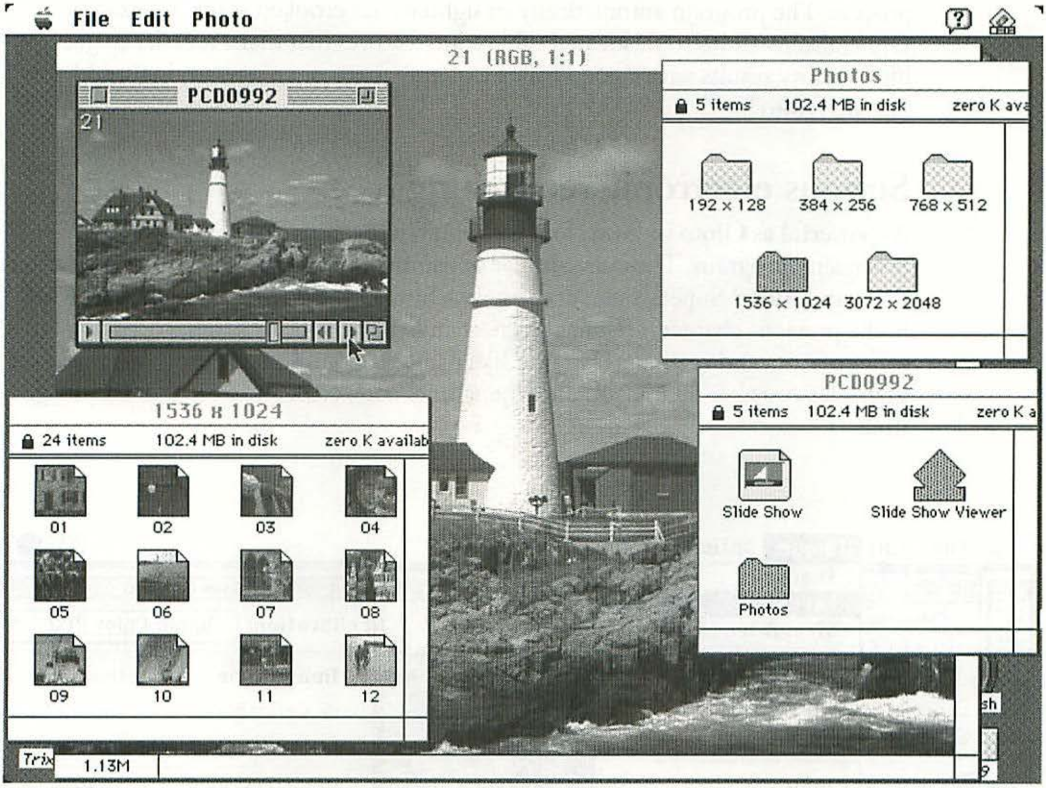


Figure 14-3: Accessing PhotoCD Images Apple's CD-ROM drives include software that makes working with PhotoCD images more convenient. The Slide Show Viewer utility lets you browse through the images on a CD using the QuickTime movie controller (upper left). Note the various folders on the CD itself — each holds images at various resolutions. Open a folder and you see a thumbnail version of each image.

Image Processing Software

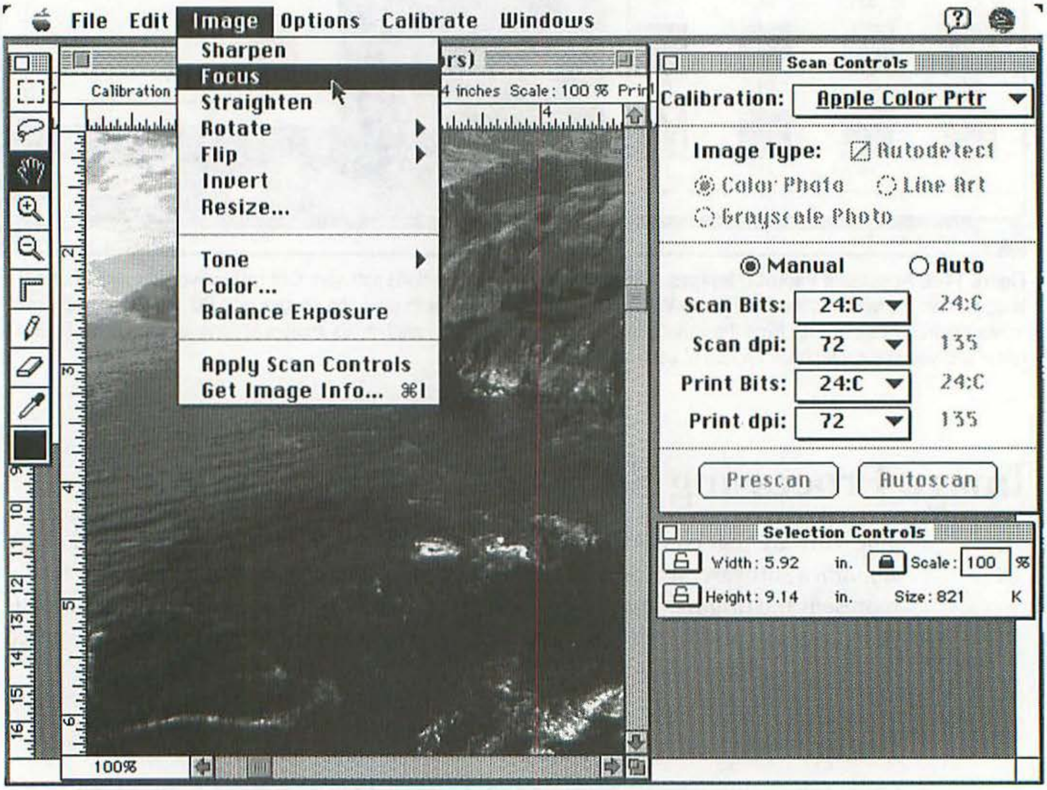
The software that comes with a scanner or frame grabber is sometimes called *image acquisition* software. It works with the hardware to acquire the ones and zeros that represent the original image and enables you to save it on disk. Most image acquisition programs also have rudimentary editing features — for cropping out unwanted borders, for example.

Image acquisition programs

One of the better image-acquisition programs is LightSource's Ofoto, which comes with Apple's scanners and is also available separately for use with other popular scanners. Ofoto includes numerous features that streamline the scanning process: The program automatically straightens out crooked scans, for example. Ofoto also provides sophisticated calibration features that make it easier to get high-quality results with a good balance of gray tones or colors (see Figure 14-4 "Inside Ofoto").

Serious electronic retouching

As powerful as Ofoto is, for serious electronic retouching you'll want an image processing program. These are similar to painting programs such as Claris' MacPaint and Aldus' SuperPaint. All work with bitmapped graphics, which, as you saw in the previous chapter, are images whose individual dots, or pixels, correspond to a series of ones and zeros, or bits. And like paint programs, image processing programs let you alter an image's underlying ones and zeros, and thus alter the image itself.



Calibration: Apple Color Prtr

Image Type: ☒ Autodetect

● Color Photo ○ Line Art

○ Grayscale Photo

● Manual ○ Auto

Scan Bits: 24:C 24:C

Scan dpi: 72 135

Print Bits: 24:C 24:C

Print dpi: 72 135

Width: 5.92 in. Scale: 100 %

Height: 9.14 in. Size: 821 K

Figure 14-4: Inside Ofoto Light Source's Ofoto, included with Apple's scanners and available separately for third-party scanners, is a sophisticated scanning application that automates much of the grunt work behind scanning — cropping, straightening, and adjusting brightness and contrast.

Image processing and painting programs have much in common. Both provide on-screen tool palettes containing electronic erasers, pencils, and paintbrushes as well as tools for typing text and drawing lines, circles, and squares. You can zoom in on individual pixels for detailed work, or zoom out to fit an entire image on the screen. And you have two basic ways to select part of an image to move or modify it: A marquee tool lets you select rectangular areas, and a lasso tool lets you select irregularly shaped areas.

Grayscale versus color

Just as some paint programs are color blind, some image processing programs work with only grayscale images. Grayscale programs include Fractal Design's Sketcher; Aldus' Digital Darkroom; and a first-rate but little-known program, MicroFrontier's Enhance. In the color field, the market leader is Adobe's remarkable Photoshop, followed by Fractal Design's ColorStudio.

A Bigger, Better Toolbox

One way image processing programs differ from most of their painting partners is that they provide more tools for drawing and modifying. Most programs provide an electronic airbrush whose flow rate and nozzle size you can adjust for painting anything from fine details to digital graffiti. A smudge tool lets you smear part of an image as though it were a charcoal drawing and the mouse pointer was your fingertip. A blur tool softens part of an image; a sharpen tool does the opposite. A rubber stamp tool duplicates one part of an image as you drag the mouse over a different part.

A wide variety of options

The tools in an image processing program are also laden with options for tailoring how they work. How fat should the pencil point be? Should paint flow continuously from the paint brush tool or fade as you paint? Or should it fade, then strengthen, then fade again as though you're repeatedly applying short brush strokes? Should the paint or pencil lead be opaque, obscuring whatever it touches, or should it be transparent like watercolor?

Photoshop versions 2.5 and later provide two tools that anyone who has worked in a darkroom will find familiar — the dodge and burn tools. The dodge tool lets you lighten an area — as if you were blocking part of the light coming from a photographic enlarger (see Figure 14-5 "Dodging Photoshop"). The burn tool lets you darken an area — as if you were allowing light to reach an area for a longer length of time.

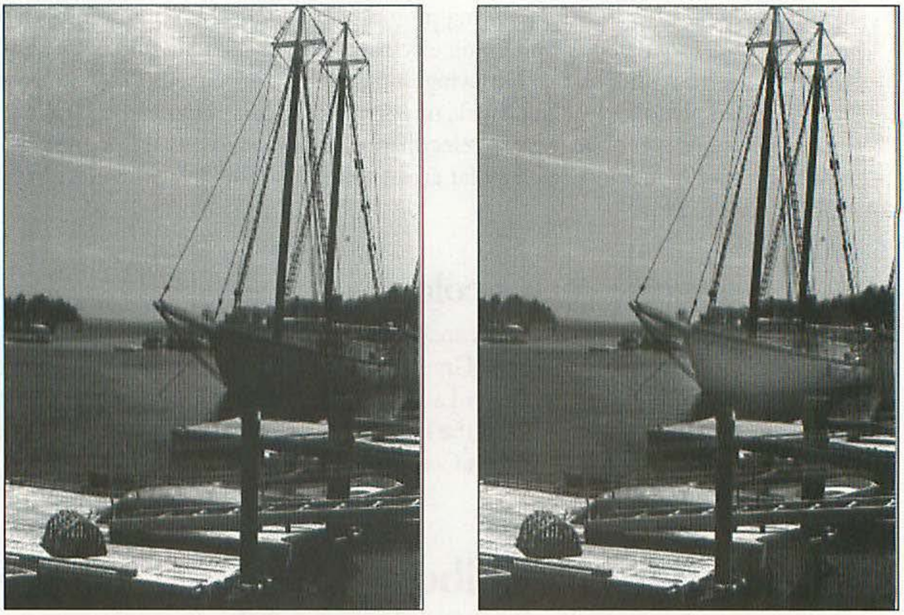


Figure 14-5: Dodging Photoshop Photoshop's dodge tool simulates a common darkroom technique — blocking part of the light coming from a photographic enlarger in order to lighten an area.

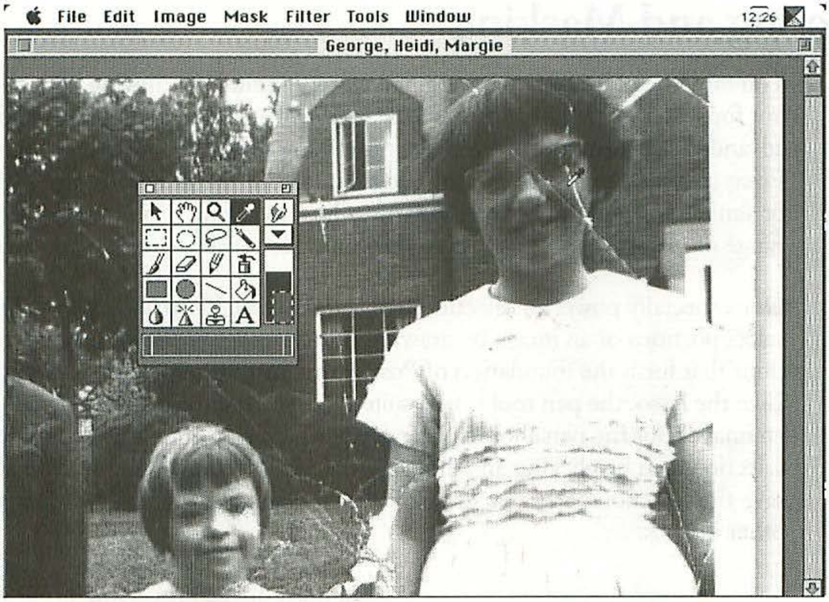
A plethora of palettes

Image processing programs also provide palettes that let you choose from a variety of gray shades and, in some programs, colors. If you're retouching a scratch out of a photo, you might use the palette to select the gray shade or color you need before applying it with the paint brush tool. Better still, use the program's eye dropper or pickup tool: Point to a spot adjacent to the scratch and click, and the program automatically selects the gray shade or color you need (see Figure 14-6 "Pick Me Up").

Getting rid of the jaggies

One classic drawback of bitmapped graphics programs is that the edges of shapes you draw appear jagged, especially when laser-printed. Image processing programs eliminate this drawback through *anti-aliasing*, which smooths jaggies by adding shaded pixels. Most programs can apply their anti-aliasing talents to text if you use TrueType or Adobe Type Manager (Photoshop includes the latter).

Text is still a second-class citizen in image processing programs. You can't edit or reformat it as you can in a drawing program such as Claris' MacDraw, Adobe Illustrator, Aldus FreeHand, or Deneba's Canvas. If you need to add a lot of text to an image, import the image into a drawing or page-layout program.



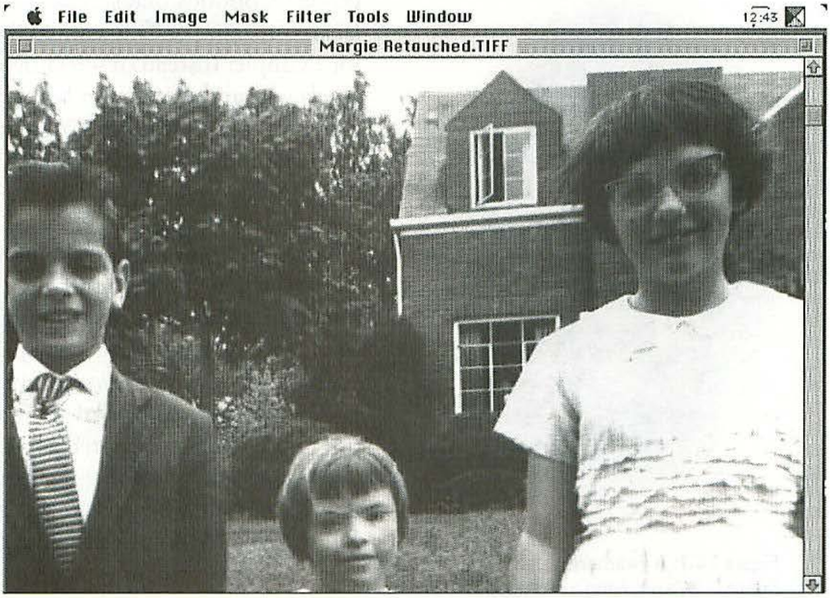


Figure 14-6: Pick Me Up Retouching scratches in an old photograph is simplified by an eye dropper tool, which lets you pick up a color or gray shade to use elsewhere. The eye dropper tool picks up a gray shade (top) for retouching the scratch on the face to create the final retouched image (bottom). The blur, rubber stamp, and smudge tools are also useful for retouching.

Selecting and Masking

You often need to select part of an image as a prelude to moving or modifying it, but for selecting fine details, the basic marquee and lasso tools aren't enough. One advanced selection tool most image processing programs provide is a magic wand: Point to a spot and click, and the program selects all contiguous pixels of the same or similar color or gray shade. You can adjust the wand's tolerance to select a wide range of similar colors or grays or only ones identical to the spot you clicked.

One especially powerful selection tool is the Adobe Photoshop pen. It lets you select portions of an image by drawing Bezier curves, those geometric constructions that form the foundation of PostScript illustration programs and type fonts. Like the lasso, the pen tool is best suited to selecting irregularly shaped portions of an image. But the pen allows for far greater precision, and it lets you fine-tune the selection area by clicking and dragging the curves' control points. You can even save the selection paths you draw to reapply them elsewhere in the image or in other images.

In most image processing programs, even the lowly lasso and marquee tools have powerful options that simple paint programs lack. You can specify a feathered selection, for example: Instead of selecting only the pixels within the selection boundary, the program throws in extra pixels on either side of the boundary and fades them (see Figure 14-7 "A Feathered Friend").

These selection variations help in two ways — when you're modifying parts of an image and when you're creating masks. Just as masking tape prevents stray paint from staining woodwork, a *mask* prevents stray pixels from fouling part of an image. You might use a mask to protect an area adjacent to the spot you're retouching or to add a new background by combining images (see Figure 14-8 "Moon Over Chicago").

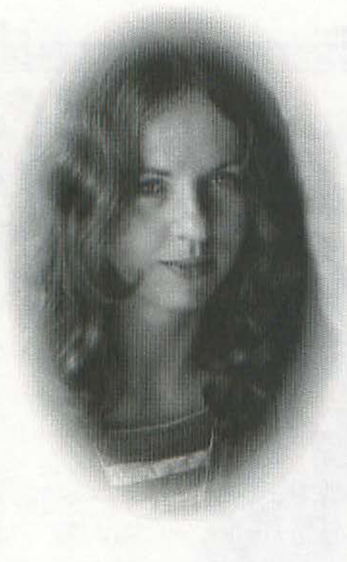


Figure 14-7: A Feathered Friend By specifying a feathered selection, you can create vignette effects such as this one. Feathered selections help minimize jarring transitions when you're pasting one image into another.

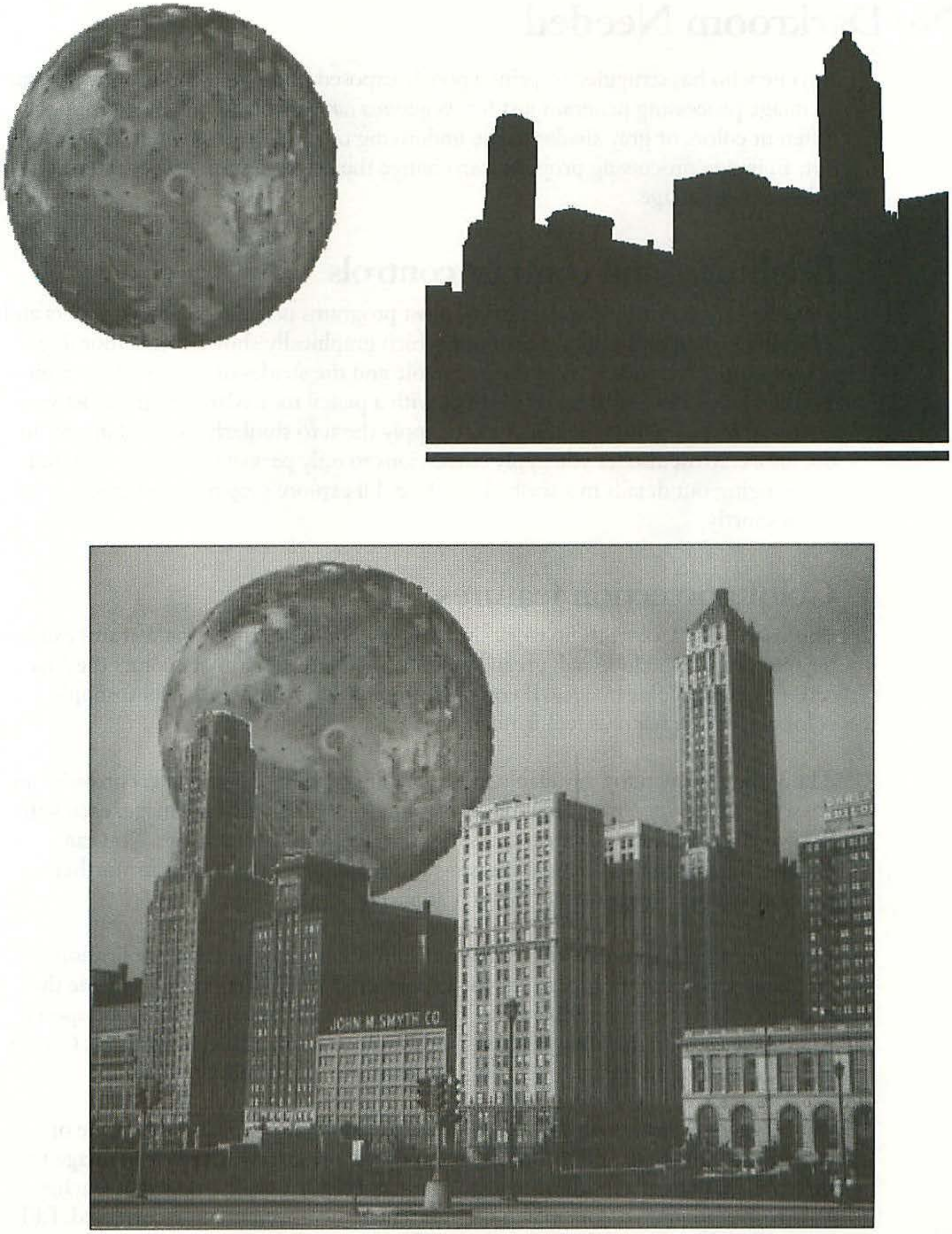


Figure 14-8: Moon Over Chicago Io, one of the moons of Jupiter, rises over Chicago. This composite was created with the moon (top left) with a slightly feathered edge, a mask for the skyline (top right), and then pasting the moon into position (bottom). The mask protects the buildings, enabling the moon to appear behind them.

No Darkroom Needed

Anyone who has struggled to print a poorly exposed photo in a darkroom will want an image processing program just for its *gamma correction* features. By assigning different colors or gray shades to the underlying ones and zeros that describe each dot, an image processing program can change the brightness, contrast, and color balance of an image.

Brightness and contrast controls

For adjusting brightness and contrast, most programs provide on-screen sliders and a window containing a *gray map* graph, which graphically shows the relationship between the ones and zeros in the image file and the shades of gray on the screen. You can tailor the gray map by drawing with a pencil tool. Most programs let you save gray maps on disk, enabling you to apply them to similarly exposed images in the future. Most also let you apply corrections to only part of the image — useful for bringing out details in a washed-out face. I'll explore gray map features in more detail shortly.

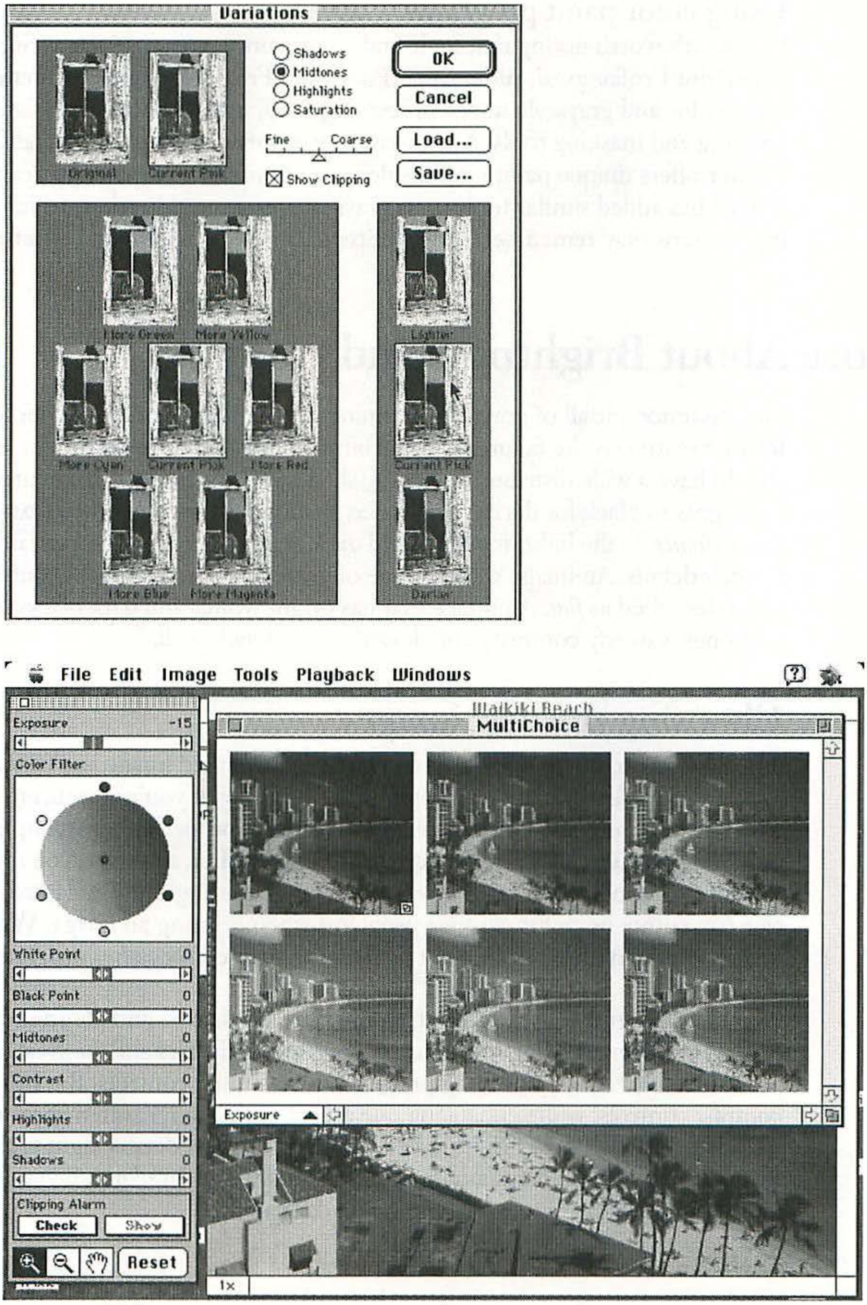
Color correction features

Photoshop and ColorStudio work similarly, except their correction features extend beyond grays to include red, green, and blue — the three primary colors the Mac mixes to create color images. If you do any color darkroom work, Photoshop's color correction features feel familiar.

The Variations window (available in Photoshop versions 2.5 and later) provides an on-screen *color ring-around* that displays numerous versions of an image, each with its own color balance, contrast, and saturation (color purity) settings. You can choose the one that looks most pleasing and use it as-is or as a basis for further refinements (see Figure 14-9 "Color Variations").

You can find this multiple-choice approach in other image-editing applications, including Cachet from Electronic for Imaging (EFI). Cachet doesn't provide the wide array of retouching tools that Photoshop does. It's a color-correction specialist designed to supplement programs such as Photoshop. (Indeed, EFI calls Cachet a *color editor*, not an image processing program.)

Cachet takes a clever approach to color correction that eliminates the hassle of calibrating a monitor and printer. You adjust the on-screen colors of an image to match the colors of a reference image that has already been corrected in Cachet. When your image's colors match the reference, the image is color-corrected. EFI calls this approach *edit by reference*. Cachet includes a large library of reference images, which you can supplement with your own corrected images.



○ Shadows
● Midtones
○ Highlights
○ Saturation

☒ Show Clipping

Exposure -15
White Point 0
Black Point 0
Midtones 0
Contrast 0
Highlights 0
Shadows 0

Exposure ▲

Figure 14-9: Color Variations Top: The Variations window in Photoshop provides an on-screen color ring-around that displays numerous versions of an image, each with its own color balance, contrast, and saturation settings. Bottom: EFI's Cachet.

Using color paint programs

Finally, it's worth noting that high-end color paint programs such as SuperMac's PixelPaint Professional, Aldus SuperPaint, and Fractal Design's Painter can handle some color and grayscale image processing tasks, too. Both have sophisticated painting and masking tools. As you saw in the previous chapter, Fractal Design's Painter offers unique painting tools designed to mimic real paint and canvas media. Fractal has added similar tools to its grayscale program, Sketcher, which Mac imaging veterans may remember as ImageStudio, formerly marketed by Letraset USA.

More About Brightness and Contrast

One common pitfall of grayscale scanning (and of black-and-white photography, for that matter) is the failure to get a complete range of gray tones. An image should have a wide distribution of gray shades, from white for bright areas such as highlights to black for dark areas such as shadows. In between those extremes are the *midtones* — the light, medium, and dark grays that represent most of the image's details. An image whose range of grays is too narrow lacks contrast, and is often described as *flat.* An image that has bright whites and dark blacks but few midtones is overly contrasty and doesn't show details well.

Choosing the best image

The best way to get an ideal range of grays in a scanned image is, of course, to scan a photograph that has them to begin with. Similarly, if you're capturing an image with a video camera, the key is to light the subject properly: For example, diffused light produces less contrast than direct sunlight. Often, however, you must make do with substandard photographs or lighting. In photography, a darkroom technician can compensate for contrast problems when printing an image. With scanned images, you can improve contrast by using an image processing program.

As mentioned previously, most programs have brightness and contrast controls, on-screen sliders that let you adjust the overall brightness and contrast of the image or a part of it. Many publishing programs have similar controls. But brightness and contrast controls, while enhancing one aspect of the image, often cause degradation elsewhere. If you boost brightness to bring out shadow details, light areas of the image become washed out and their details disappear. Similarly, if you increase contrast, details are lost in both light and dark areas.

Gray map displays

A better way to improve brightness and contrast involves using another of the contrast-adjustment features I mentioned earlier — a gray map display. This is a graph whose horizontal axis shows the original brightness values in the file — the input values — and whose vertical axis shows the new brightness values, or the output values. By altering the shape of the graph, you tell the image processing program to assign new values to the image's underlying data, thus changing its brightness and contrast (see Figure 14-10 "Working with Grays").

When you draw a custom gray map curve, you're performing *nonlinear* correction: You're altering the original image's data in varying degrees to improve the image's appearance. By comparison, when you use a brightness or contrast control, you're performing *linear* correction — remapping all the values to the same degree, which can lead to the loss of details in bright or dark areas.

You can also use a gray map graph to create special effects. Draw a line shaped like a *V*, for example, and you get a solarized effect similar to that produced in a darkroom when a developing print is briefly exposed to light.

A Graph of Grays

One particularly powerful correction aid is a *histogram*, a bar chart that shows which gray shades appear in an image and to what degree. You can use a histogram to determine the kind of correction an image needs and to judge the effectiveness of your correction techniques.

Working with histograms

For example, if most of a histogram's bars are at the left or right end of the chart, the image is probably too dark or too light. As a general rule, an image's histogram bars should form a fairly smooth curve (see Figure 14-10 "Working with Grays").

If an image's histogram looks like a mountain range alternating with plains, the image probably has too much contrast. A flat image's histogram is narrow, with most of the bars appearing in the midtone area and few or no bars at the black and white ends of the graph.

Using the Equalize command

In many cases, improving a mediocre image doesn't require fiddling with contrast controls, gray maps, or histograms. Most programs provide an Equalize command,

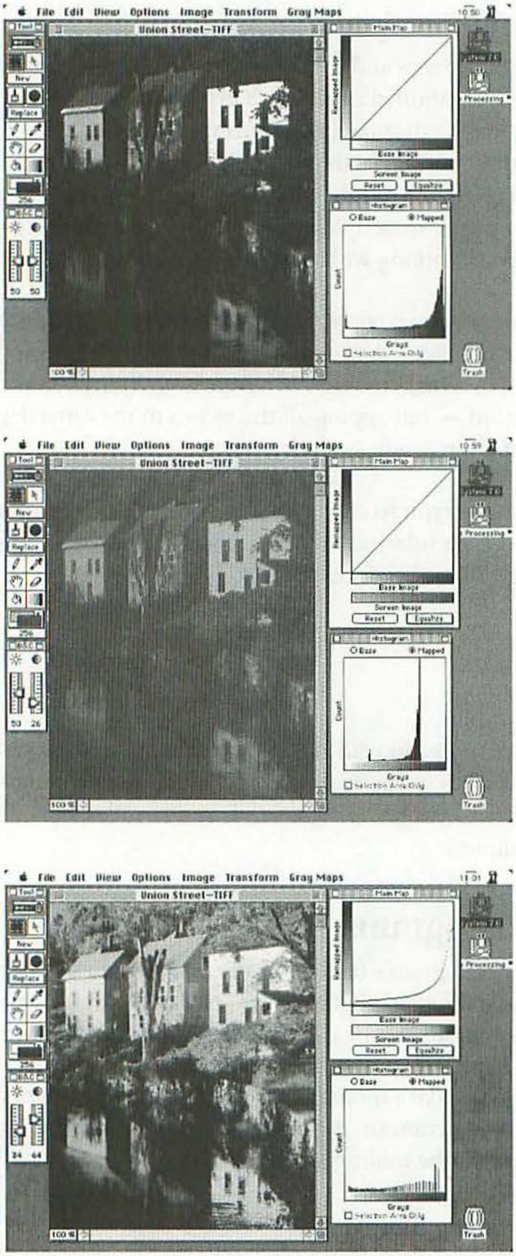


Figure 14-10: Working with Grays Brightness and contrast controls and gray map displays let you finely tailor brightness and contrast, and histograms let you view the distribution of gray levels. The original image (top) with brightness, contrast, and gray map unchanged. The image is too dark: Note the histogram shows more dark shades than light ones. An image lacking contrast (middle) appears flat, and its histogram lacks values at the light and dark ends of the spectrum. Brightness and contrast have been tweaked (bottom) and the gray map altered to produce a more appealing image and a wider distribution of grays in the histogram. Aldus' Digital Darkroom was used for these examples.

which mathematically adjusts the image's data to produce a more even range of light and dark shades. Examine a histogram after equalizing, and you'll see that the graph reflects a broader range of grays.

Filtering

Histogram and gray-mapping features alter an image's grays; *filters* alter the image itself. By examining an image's underlying data and then applying calculations to it, an image program can modify the image (see Figure 14-11 "A Filter Sampler"). Some filters enhance the quality of an image: A sharpening filter, for example, can bring out details lost during scanning.

Producing special effects

Other filters produce special effects, with Photoshop's filters leading the pack. Its Motion Blur filter simulates motion by blurring the image in a single direction, and the Zigzag filter creates rippling effects — as if viewing an image through water. The Pointillize filter makes an image look like it was painted in a pointillist style. The Swirl filter simulates an image's journey down a drain, and the Spherize filter simulates a fish-eye lens or a Christmas tree bulb. You can spend hours exploring Photoshop's filters — and waiting for the results: It can take a Quadra-class machine half an hour to filter a large color image.

QUICK TIPS

Choosing Your Image-Enhancement Weapon

Brightness and contrast controls, gray map displays, histograms, Equalize commands: How do you decide which correction scheme to use? Try the Equalize command first. It's the easiest of the four techniques, and it's often all you need. If it isn't, the Undo command puts you back to square one, where you can try the other techniques, relying on the histogram and your eyes to get the results you want.

If you retouch an image using the paint brush, smudge, rubber stamp, and other tools discussed earlier, fix the image's brightness and contrast problems before retouching. Otherwise, the image may have odd splotches of gray and other undesirable artifacts. Also remember that some image processing programs let you save gray map curves and apply them to other images. This can be a big time saver if you're working with numerous images sharing the same brightness and contrast characteristics.

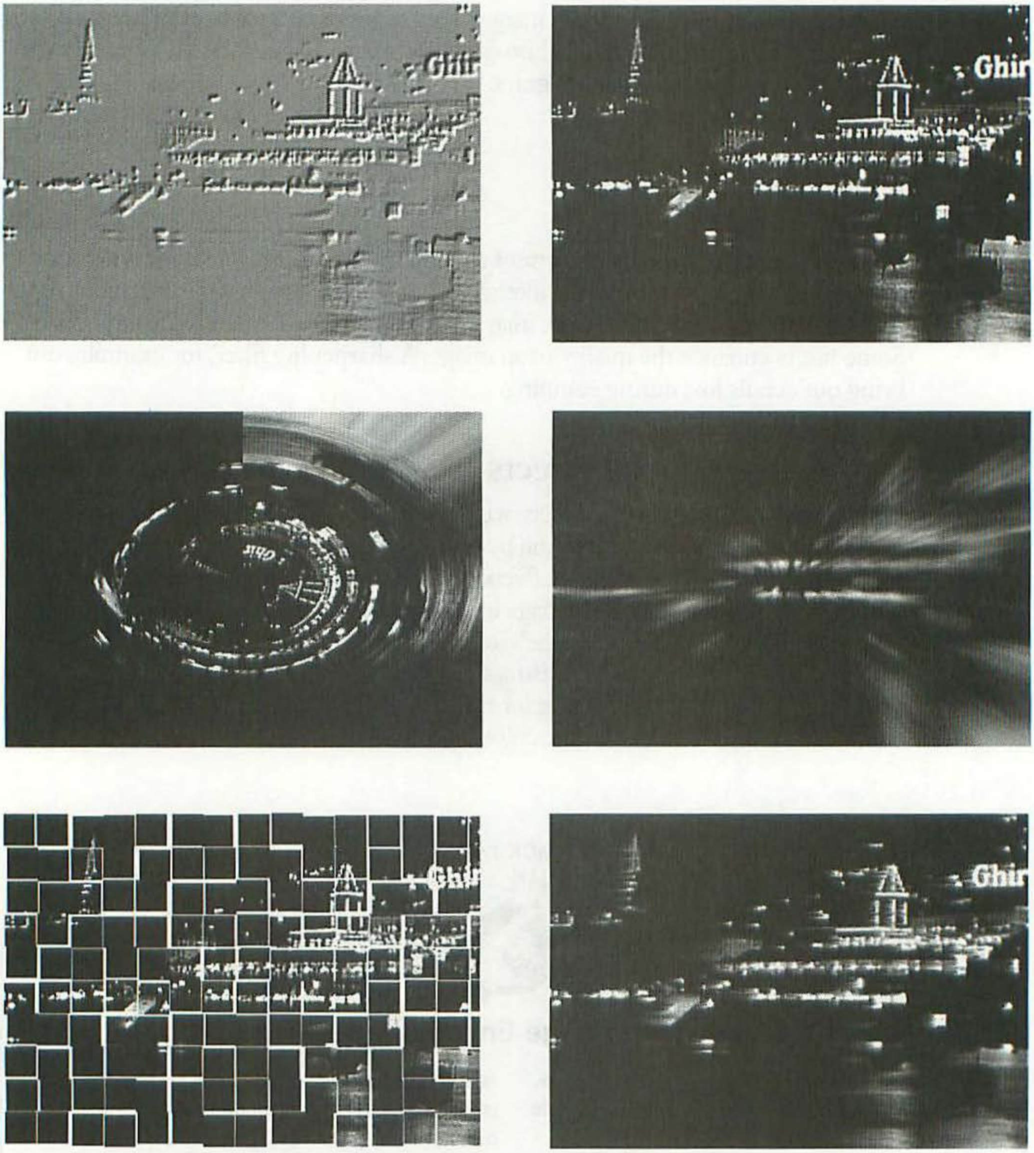


Figure 14-11: A Filter Sampler A sampling of Adobe Photoshop's special effects filters.

Some filters hint at image processing's scientific applications — edge detection filters alter an image so that only its edges appear, and can be useful for creating unusual embossed effects. Photoshop also enables you to create new filters by editing a table of data (technically, a *convolution matrix*) that tells the program how to alter pixels based on their neighbors.

Plug-in filter modules

Most programs come with several filters and enable you to add new ones by using *plug-in modules*, separate miniprograms that add new features to the program. This software expandability has created a market for filters. Aldus' Gallery Effects series, for example, includes filters for texture, watercolor, pen-and-ink, and other effects. If you don't have an image processing program, you can use an included application or desk accessory to alter images.

Gallery Effects even includes an external command (XCMD) module that lets you access its filters from within HyperCard. The filters work with Adobe Photoshop and Aldus' Digital Darkroom and SuperPaint. Other popular filter libraries include HSC Software's Kai's Power Tools; Xoas Tools' Paint Alchemy; and Andromeda Software's Photography Filters and Three-D Filters.

It's worth nothing that some plug-ins aren't filters, but instead add new features to Photoshop, such as the ability to control a scanner — a time saving feature that enables you to scan, enhance, and retouch within a single program. Most scanners

QUICK TIPS

Speeding Up Photoshop Filters

Complex filtering operations can take a long time, even for a fast Mac. One solution is to speed up your Mac's overall operation with an accelerator board (see Chapter 31). Another is to add a digital signal processing (DSP) board to your Mac. A DSP board contains a specialized processor designed for the number-crunching demands of image processing. Unlike a general-purpose accelerator, a DSP board won't speed your Mac's overall operation. It's specifically designed to speed up filtering, selecting, and other common Photoshop operations.

Two DSP boards designed for Photoshop are DayStar Digital's Charger and Spectral Innovations' Lightning Effects. Both are available as NuBus boards for all NuBus-equipped Macs; the Lightning Effects board is also available as a processor-direct slot (PDS) board that installs in a Quadra. Radius' PhotoBooster is a PDS board for the Mac Quadra family. PhotoBooster uses an AT&T DSP3210 — the same 32-bit DSP chip used in Apple's AV Macs. The PhotoBooster is compatible with the Apple Real-Time Architecture (ARTA) used by the AV models (see Chapter 34).

Spectral Innovations also offers Photoshop filters that take advantage of the DSP chips that are built into AV Macs such as the Centris 660AV and Quadra 840AV.

Whether or not you use a DSP chip to speed up Photoshop, remember that you can preview a filter's effects by selecting a small portion of an image before applying the filter. When you're experimenting with filter settings, this approach is much faster than filtering an entire image. If you're happy with the preview results, use the Undo command to restore the image, and then apply the filter to the entire area you want to modify. If you aren't happy with the preview results, choose Undo and try, try again.

now include these Photoshop *import modules.* Similarly, some color printers include a Photoshop *export module* that enables you to bypass the Mac's standard printer driver when printing images, a scheme that results in better image quality and faster print times.

The Problems with Printing

You've tweaked grays, retouched scratches, and filtered an image into a digital masterpiece. The next step — paper. This stage is often the most disappointing part of desktop image processing. Because of the way most printers handle grayscale or color images, your printed results can't match the quality you see on the screen.

The heartbreak of halftoning

Several factors contribute to the disappointing look of printed images, but foremost among them is halftoning. Unlike monitors, monochrome printers can't produce shades of gray, but must simulate grays by using black dots of varying size. Similarly, most color printers must combine cyan, yellow, magenta, and black dots in various patterns to create their hues.

To create these dots, a printer combines the smallest dots it can create into clusters called *cells,* and then turns on varying numbers of dots within each cell. The number of cells per inch corresponds to the *screen frequency,* and is usually measured in lines per inch (lpi). (The term screen frequency derives from conventional photographic halftoning, in which an image is photographed through a special mask containing thousands of minute, regularly-spaced holes.)

When printer dots are combined into larger cells, the printer's resolution effectively plummets. A 300-dpi laser printer's ideal halftone screen frequency is only about 53 lines per inch (lpi) — short of the 85-lpi screens often used in newspapers and of the 133- to 150-line screens used in magazines. Image processing and desktop publishing programs let you specify a higher screen frequency, but doing so reduces the number of gray levels you can print. With a 53-line screen, a 300-dpi printer can produce roughly 30 gray levels, which are barely enough. With a 100-line screen, it delivers only 9.

Using high-resolution printers

The key to better digital halftones is to print on a device with higher resolution. Laser printers with resolutions of 600 dpi and higher are common: Examples include Apple's LaserWriter Pro series, Hewlett-Packard's LaserJet 4M, and QMS'

PS-420. A 600-dpi printer can produce attractive 85-lpi halftones. Better still is Apple's PhotoGrade technology, which is built into the LaserWriter Pro 600 and 630 as well as the older LaserWriter IIf and IIg printers. PhotoGrade finely controls these printers' lasers to yield 106-lpi halftones (see Chapter 32 for output samples and more PhotoGrade details). Best of all, of course, is an imagesetter, which can produce magazine-quality halftones.

Many other variables influence the appearance of printed images. The printer itself is one: Printers and imagesetters vary in their ability to accurately translate grays in an image to halftone cells on a page. Paper is another: Every stock has unique texture and light-reflection properties. And if you photocopy a printed image or print it on an offset printing press, you introduce still more variables.

Printer calibration curves

To compensate for these variables, use your image processing or scanning software to create a *printer calibration curve.* This is a document whose data describes the relationship between the grays in an image and the grays that your printing process reproduces: It's a kind of gray map for printing. For an overview of the process, see the Step-by-Step box "Calibrating a Printer."

Storing it Away

A major issue involves choosing a file format for images. All image processing programs support several formats. Your goal is to settle on one that uses disk space efficiently, is supported by your desktop publishing program, and is compatible with any other software you plan to use on the images.

Letraset's RIFF format is efficient and supported by the QuarkXPress and Manhattan Graphics ReadySetGo publishing programs. Aldus PageMaker supports several varieties of TIFF format, including ones saved with LZW and RLE encoding. These acronyms refer to compression schemes that save space by replacing groups of identical values with a code. You use a similar technique when you say "a dozen eggs" instead of saying "egg" twelve times.

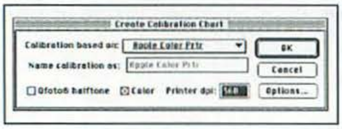
Look before you leap

Matching file formats is one of the easier aspects of electronic imaging. Although programs like LightSource's Ofoto streamline the scanning process, getting top-notch results is not a point-and-click proposition. Before taking the image processing plunge, step back and assess your goals. If you want high-quality half-

STEP-BY-STEP

Calibrating a Printer

A calibration curve tells an image processing program how a given printer or printing process handles grays, enabling you to get more accurate and more consistent output. The specific steps for creating a calibration curve vary from program to program, but the general routine is outlined in the steps below.



Calibration based on: Apple Color Prtr

Name calibration as: Apple Color Prtr

☐ Ofoto® halftone ☒ Color Printer dpi: 360

To create a calibration curve:

1. **Print the grayscale test chart built into the image processing or scanning program, using the paper you normally use.**
2. **If you'll be offset printing or photocopying your final images, run the printed test chart through your printing process, using the same ink, imagesetter, printing press or copier, and paper stock that you'll use for the final product.**
3. **Scan the chart (or its photocopied or offset-printed version).**
4. **Depending on the software you use, you may at this point have to use the program to measure the scanned gray shades and manually enter values for the calibration curve.** Programs such as Ofoto, the software that accompanies Apple's OneScanner, perform this chore automatically.
5. **Save the calibration curve.** Apply the curve to an image just before printing it (or just before saving it, if you'll be importing it into a publishing program). Because the curve will alter the image's brightness and contrast, don't apply it until you've performed other retouching and correction steps.

tones in desktop publications, you may be better off using conventional photographic halftones, which are inexpensive and can be superior to digital halftones.

Many publishers are committed to pushing the technology and adopting all-electronic publishing techniques, but with that commitment come myriad technical and logistic hurdles. If conventional techniques are working for you now, take a slow and steady approach to going electronic. The problem with pushing technology is that technology often pushes back, and usually when you're on a deadline.

CHAPTER 14 CONCEPTS AND TERMS

- The trend toward electronic photography is fueled by its speed, convenience, flexibility, and environmental friendliness.
- To generate electronic images, you need a scanner (grayscale, color, or slide), a still-video camera, video-capture hardware, or a CD-ROM drive capable of reading Kodak PhotoCD discs. A large selection of stock photographs is also available on CD-ROM.
- Most scanners include image-acquisition software that controls the scanner and provides basic editing features. Some machines also include Adobe Photoshop.
- Image-processing programs are bitmapped (paint) programs that provide sophisticated tools for controlling brightness, contrast, color balance, and for editing and retouching images.
- Most image-processing programs provide filters that can sharpen, blur, and otherwise modify all or part of an image. Adobe Photoshop provides the largest array of filters, and can accept additional ones through software plug-in modules.
- An image processing program's histogram and gray map graphs can be useful tools for analyzing and fine-tuning the range of grays or colors in an image.
- Laser printers and other relatively low-resolution output devices often yield disappointing results due to the halftoning process. The higher a device's resolution, the better the quality of its halftones.
- Helpful hardware for advanced image processing includes a CD-ROM drive, a large-screen color or grayscale monitor, a color-calibration device, an accelerator board, and a memory upgrade.

8-bit scanner
A scanner that assigns 8 bits to each pixel, and is capable of discerning roughly 256 levels of gray.

24-bit scanner
A scanner that assigns 24 bits to each scanned pixel and can discern between millions of colors.

anti-aliasing
A technique that smooths the jagged edges of characters or shapes by adding shaded pixels.

color correction
Tweaking the hues in an image for greater realism.

color ring-around
A multiple-choice color-correction feature that displays numerous versions of an image, each with its own color balance, contrast, and saturation (color purity) settings. You can choose the one that looks most pleasing and use it as-is or as a basis for further refinements.

color separation
Dividing a color image into four separate images, one each for cyan, magenta, yellow, and black — the four *process colors* that printing presses combine to print color images.

continuous tone image
An image, such as a photograph, that has subtle variations in gray levels or colors.

digital signal processing (DSP) board
A hardware add-on containing a specialized processor designed to speed up filtering, selecting, and other common image-manipulation operations.

feathered selection
A selected area whose edges are faded slightly instead of being sharp, providing a less-jarring transition.

filter
A software routine that alters an image by examining its underlying data and then applying calculations to it.

flat
An adjective applied to images whose range of grays is too narrow, resulting in insufficient contrast.

gamma correction
Assigning different colors or gray shades to the underlying ones and zeros that describe each dot, thereby changing the brightness, contrast, and color balance of an image. *Nonlinear correction* involves altering the original image's data in varying degrees to improve the image's appearance. *Linear correction* involves remapping all the values to the same degree, which can lead to the loss of details in bright or dark areas.

gray map
A graph that depicts the relationship between the ones and zeros in the image file and the shades of gray on the screen. The horizontal axis shows the original brightness values in the file — the input values — and the vertical axis shows the new brightness values, or the output values.

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halftoning
Simulating shades of gray or colors by using black or colored dots of varying size. To create these dots, a printer combines the smallest dots it can create into clusters called cells, and then turns on varying numbers of dots within each cell. The number of cells per inch corresponds to the screen frequency, and is usually measured in lines per inch (lpi).

image acquisition software
Software included with a scanner that works with the hardware to acquire the ones and zeros that represent the original image and enables you to save it on disk. Most image acquisition programs also have rudimentary editing features.

Kodak PhotoCD
A Kodak-developed technology that provides high-quality, CD-ROM-based electronic images along with conventional prints or slides.

mask
An electronic version of masking tape that you can use to prevent stray pixels from fouling part of an image. You might use a mask to protect an area adjacent to a spot you're retouching or to add a new background by combining images.

midtones
The light, medium, and dark grays that represent most of an image's details.

multisession CD
A special CD-recording technique that enables you to add images to an existing Kodak PhotoCD disc. To work with multisession PhotoCD discs, you need a CD-ROM drive that supports XA Mode 2.

plug-in modules
Separate miniprograms that add new features to a program. A plug-in module might be a filter that modifies an image; an import module that lets you control a scanner from within a program; or an export module that lets you save an image in a special format or print it on a color printer.

printer calibration curve
A document whose data describes the relationship between the grays in an image and the grays that your printing process reproduces.

slide scanner
A scanner designed specifically for scanning color transparencies, usually 35mm slides.

still video camera
An all-electronic camera that saves images not on film, but in memory or on tiny floppy disks.

video digitizer
Also called a *frame grabber,* a hardware add-on that creates editable images from a video source such as a camcorder or videocassette recorder.

Glossary of common image-editing tools

airbrush
A tool that simulates an airbrush. You can adjust the tool's flow rate and nozzle size.

blur
A tool that softens part of an image.

burn
A tool that lets you darken an area of an image as if you were allowing extra light from a photographic enlarger to reach a piece of photographic paper.

dodge
A division of Chrysler Corporation. Also a tool that lets you lighten an area of an image — as if you were blocking part of the light coming from a photographic enlarger.

eye dropper
A tool that lets you select a gray shade or color by clicking an existing portion of an image. Called a pickup tool in some programs.

lasso
A tool for selecting irregularly shaped areas.

magic wand
An advanced selection tool that lets you select all contiguous pixels of the same or similar color or gray shade by pointing to a spot and clicking.

marquee
A tool for selecting rectangular areas.

pen
A tool that lets you select portions of an image by drawing Bezier curves, those geometric constructions that form the foundation of PostScript illustration programs and type fonts.

rubber stamp
A tool that duplicates one part of an image as you drag the mouse over a different part. Called a clone tool in some programs.

sharpen
A tool that sharpens part of an image.

smudge
A tool that lets you smear part of an image as though it were a charcoal drawing and the mouse pointer was your fingertip.

CHAPTER FIFTEEN

Three-Dimensional Graphics

IN THIS CHAPTER

- Creating photorealistic 3-D images
- Modeling, extruding, rendering, ray tracing, and other 3-D jargon defined
- Equipping your Mac to run 3-D programs
- Using Pixar Typistry and StrataType 3d to create text with depth
- Preparing your 3-D shopping list
- Getting good results in less time

Mac graphics programs are taking on a new dimension — the third dimension. Painting and drawing programs mimic canvases or drafting tables, but a growing number of programs mimic the real world, where objects have height, width, depth, shadows, textures, and perspective — and where those characteristics appear to change as you move around. Many programs also provide animation features that let you put those objects into motion.

Architects can use 3-D programs to create animated walk-throughs that enable clients to tour a building before it exists. Programs such as Virtus' WalkThrough hint at the brave new world of *virtual reality*, where you can create and explore places that exist only in the digital domain.

Engineers and industrial designers use 3-D programs to create realistic renditions of space stations, cars, lampshades — you name it. Package designers create 3-D mock-ups of packaging and wrap text and images around their labels. Graphic designers create special text effects, such as glittering logos that appear to be cast in chrome. Film and television studios can experiment with different set designs and camera angles without having to construct the real thing. Artists can create images that would be difficult or impossible to produce with programs such as Adobe Illustrator or Aldus FreeHand. And graphics buffs can experiment with creating the kinds of photorealistic images that make 3-D programs so enticing.

ON THE CD

- StrataType 3d
- StrataVision 3d
- Adobe Dimensions
- Infini-D

Three-dimensional graphics programs are among the most complex programs you can find on a personal computer; to use them, you need to come to terms with a bevy of brain-bending technical and geometric concepts. Forget trying to learn a 3-D program without opening the manual, even if you've already mastered a 2-D program. You need every tutorial a program's manual provides along with hours of practice — just to master the basics.

You may need hours of patience, too. It isn't unusual to wait an hour or more for a 3-D program to create a complex photorealistic scene. You can almost raise a family in the time required to create a 3-D animation containing hundreds of separate images. And although a few 3-D programs run on a Mac Plus, SE, or Classic, most require a high-end machine or an accelerator board. For best results, throw in a memory upgrade to bring your Mac up to at least 8MB, a high-capacity hard disk, 24-bit video hardware, and a large-screen monitor.

But cost is relative. Many 3-D programs have features that were found only on six-figure workstations not long ago. For businesses that can't afford such hardware — or that don't want to waste their workstations on small jobs — waiting while a Mac 3-D program generates a complex image is a small price to pay. The third dimension can be a fascinating and rewarding place — if you approach it with the proper perspective (pun intended). As I show you in this chapter, that involves understanding the concepts behind 3-D graphics, and then choosing a program that can handle the types of images you want to create.

Three Steps to 3-D

The best way to understand the process of creating a 3-D image is to imagine you're an architect building a house model that you will then photograph for publication. Your first step is to cut pieces of balsa wood into the appropriate shapes to represent the roof, windows, chimney, doors, and other components of the house. You glue them together, and then you paint the model to make it look more realistic — shingles on the roof, a brick-like pattern on the chimney, and woodgrain on the siding. Finally, you supply the completed model to a photographer, who illuminates it, and then photographs it using a variety of camera angles and lenses.

The modeling phase

The steps are similar with a 3-D graphics program; they just take place within the Mac. First, you use the mouse to draw shapes corresponding to the house's components. Next, you "glue" them together by dragging the shapes until they're positioned appropriately. This draw-and-glue phase is called *modeling*.

In the modeling phase, you also specify textures and perhaps colors for the surfaces in the model, assigning a shingle pattern to the roof, a brick pattern to the chimney, and a woodgrain pattern to the siding. This is the process of electronically painting your model.

Describing the scene

Setting up the final image — the equivalent of preparing a photographic set — is called *scene description.* In this phase, you specify the number and position of the lights illuminating your model, along with their characteristics — for example, whether they're bright or dim, and whether they're spotlights or floodlights. You can also specify the color of the light itself, choosing, say, a yellowish hue to simulate late-afternoon sun.

In the scene description phase, you also play the role of photographer, choosing the camera angles and the lenses that best capture your model. It helps to know a bit about photography at this stage, because a 3-D program's electronic lens acts much like a real camera's: A wide-angle lens distorts somewhat and provides better depth of field, for example, while a telephoto lens reduces the degree of perspective visible in the final image.

Rendering the image

The final phase of a 3-D imaging project is rendering. It's this stage of the process that puts your Mac through its paces, as the 3-D program grinds through the calculations required to simulate a 3-D scene. More about this step later.

I've described the modeling, scene-description, and rendering phases separately, but they don't necessarily have to occur in this order. You might, for example, adjust lighting and camera angles before assigning textures and performing other rendering tasks. What's more, not all 3-D products can handle all three phases. Some programs are modeling specialists and have minimal rendering and scene-description features. Other products handle rendering and scene description based on models you create using a different company's modeler. Still other products handle all three tasks, using either one program or separate modeling and rendering programs that you switch between as you work.

Model Shops

Modeling out of balsa wood means using a knife to cut out shapes that you attach to each other. Modeling with a 3-D program isn't as straightforward. You create basic shapes not by cutting them out, but by drawing them with the mouse.

Trickier still, you assemble those shapes not in the three-dimensional space in front of you, but in the simulated 3-D world that your program projects on the Mac's screen.

Drawing some primitives

Different modelers provide different drawing features, but in general, creating a model's basic shapes often begins with drawing *primitives* — circles, rectangles, polygons, or curves. Like drawing and painting programs, modeling programs provide on-screen palettes for their various drawing tools. But drawing a primitive is only a starting point. To create a 3-D object, you need to use either your program's lathe or extrusion features (see Figure 15-1 "Extrusion Versus Lathing").

Lathing and extruding

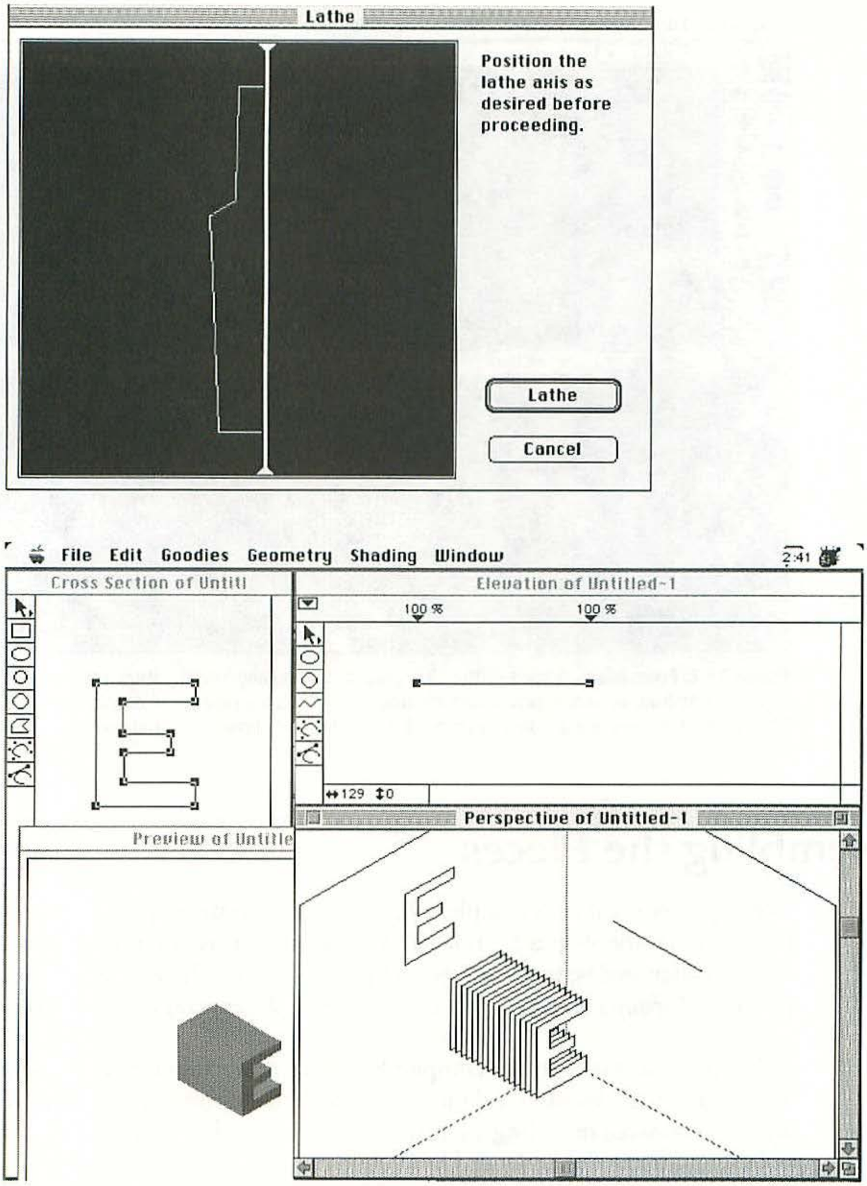
A modeler's lathe features let you create objects with radial symmetry — goblets, bowls, baseball bats, doughnuts, doorknobs, the letter *O*. When you're using a lathe, or *sweep*, feature, you generally draw half of the object — a profile — and the program rotates what you draw around an axis to create the 3-D object.

Extrusion creates a 3-D object by copying the primitive, moving the copy, and then adding edges to create a surface that connects the copy to the original. The result is a shape with a complex cross section and plain sides — as if the shape was cut out with a jigsaw or cookie cutter.

Seeing in multiple views

Creating shapes is easy compared to assembling them into complex objects and images. The fact that your link to the program's 3-D space is a 2-D screen makes it more difficult to accurately position shapes relative to each other — just as it's harder to assemble a balsa model with one eye closed.

Most 3-D programs tackle this problem by providing multiple views of your scene (see Figure 15-2 "From Many Angles"). Modifications you make in one view are reflected in the others, thus giving you the feedback needed to position objects accurately. With programs that show just one view at a time, you may need to do a bit more work moving around your model to verify that objects are positioned correctly.



Position the lathe axis as desired before proceeding.

Figure 15-1: Extrusion Versus Lathing The lathing feature in Macromedia's Swivel 3-D Professional (top) is used to create a wine bottle. Ray Dream Designer's extrusion feature (bottom) is used to create a 3-D letter.

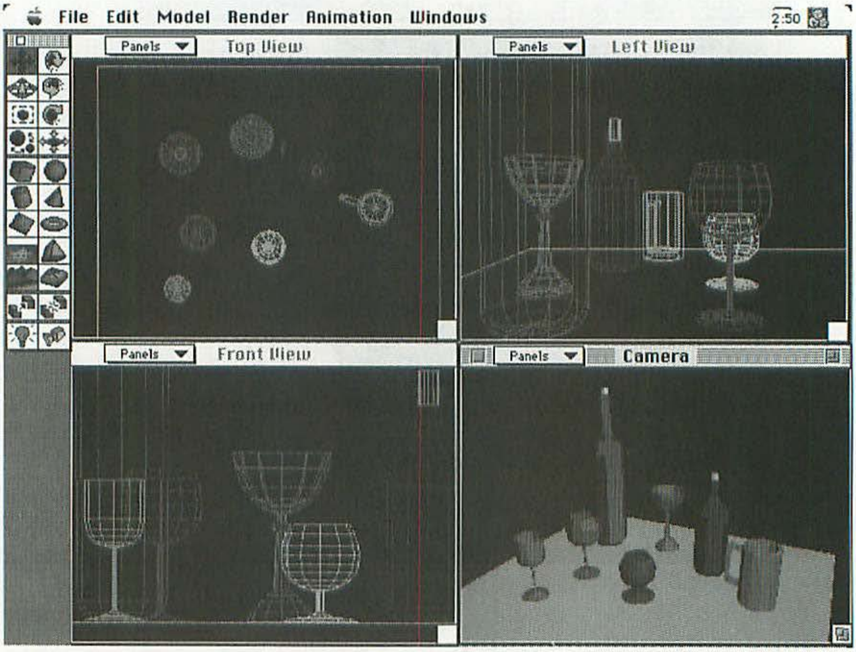


Figure 15-2: From Many Angles Most 3-D programs, including Infini-D, shown here, enable you to view a scene from several angles simultaneously, simplifying the process of positioning objects. Most also let you resize individual views to fill the screen and close views that you aren't using.

Assembling the Pieces

When you're creating a complex object out of separate shapes, you need to tell the program that the shapes are related. After all, if you are rotating a car body to view it from other angles, you want its tires to go along for the ride. Some programs provide a Group command that combines the objects you select into one.

Other programs use a more complex but more powerful hierarchical scheme. When creating a hierarchical model, you lock one or more *child objects* to a *parent object*. If you were modeling a human figure, you might use the torso as the parent object, and make the limbs and head child objects.

The hierarchical advantage

One value of a hierarchical modeling scheme is that it lets you apply constraints to child objects so they move in realistic ways. If you create a car model, for example, you may want the doors, hood, and trunk to be able to open from a certain point (the hinges), but only to a certain point (because that's how car hinges work). By applying constraints to those objects, you can create a model that more accurately represents the real thing.

Some programs provide a library feature that lets you store and recall objects for reuse. Many programs also include libraries of commonly used shapes and objects. DynaPerspective, for example, includes architecture and interior design-oriented shapes such as doors, plumbing fixtures, and office equipment.

3-D text features

As for text, you can't simply click a text tool and start typing 3-D text in your favorite font. Some modelers can generate an outline from text stored in a PICT or Adobe Illustrator file. Other programs provide a text tool that generates outlines from text you type. With either approach, you can add depth to the text by extruding the resulting outline.

If you plan to work with 3-D text extensively, investigate one of the 3-D programs that specializes in text — Pixar's Typistry or Strata's StrataType 3d (see Figure 15-3 "Text on a 3-D Stage"). You can find details on these programs in the Background box "Text with Depth."

Getting Realistic

I've already mentioned one benefit of a 3-D program — its ability to show a completed model from different angles. You can find a variety of clever navigation tools that let you rotate a model or move your vantage point, which is usually called the *camera*.

Wire frame rendering

To enable you to move objects and your vantage point without having to wait for the program to redraw the image, most 3-D programs use a wire frame rendering technique, in which only the edges of objects are drawn. Many programs can also display higher-quality versions with shading, but at the price of performance.

Texture mapping

So when do you see those stunning, photorealistic results? In time. First, you need to apply textures and other details to the surfaces in your model. *Texture mapping* features, found in most mid-range and high-end programs, enable you to apply an image to a surface — like applying a decal to a balsa model. The image may be that of woodgrain or bricks, or of text created in a different program and saved in a PICT file. A package designer may use the latter technique to wrap a label around a 3-D bottle.

(continued on page 302)

BACKGROUNDER

Text with Depth

Until recently, if you needed photorealistic 3-D text for a publication, presentation, or multimedia production, you had to use a 3-D modeling and rendering package. Buying a package like this to generate a 3-D text effect is overkill. What's more, general-purpose 3-D packages often have limited text features — if they have them at all.

Pixar Corporation's Typistry and Strata's StrataType 3d can generate photorealistic 3-D text from nearly any TrueType or Type 1 PostScript outline font. Typistry can simulate motion as well as depth. Using its straightforward animation controls, you can create the kind of animated text that pervades TV station breaks and movie-of-the-week openings. You can save completed animations in a variety of formats, including QuickTime movies.

Both programs have straightforward operating styles that invite experimentation. Start either program, and you get an untitled document window along with a tool palette for creating new text objects as well as for moving, rotating, resizing, and extruding text. (You can also use dialog boxes to specify precise rotation, extrusion, and resizing values.)

When you're typing new text, you can also choose from a variety of bevel styles to give letters a rounded, routered, or sharp-edged appearance. You can also specify the size of the bevel. When you're done, a wire frame version of the object appears in the document window (see Figure 15-3 "Text on a 3-D Stage").

After you build an object, you can position it and assign textures to its surfaces and adjust lighting. As in Pixar's Showplace, surfaces in Typistry are called *looks*. Typistry includes a selection of looks for common surfaces — shiny metal, stucco, bricks, wood, and plastic. You can also add looks that are sold separately by Pixar and third-party firms such as The Valis Group. StrataType 3d includes a wide variety of textures as well as a utility that lets you create new textures.

In the 3-D world, you view objects from the vantage point of an electronic camera. Typistry lets you use one of several lenses — normal, fisheye (exaggerates perspective), and zoom (flattens perspective). In this regard, Typistry is a bit less flexible than StrataType 3d, which provides one lens whose focal length is continuously variable.

Typistry provides 18 light sources — nine front lights and nine backlights. You can customize each light's intensity, color, and position, as well as assign electronic gels that cast shadows to simulate windowpanes, a spotlight, venetian blinds, and more. You can also specify that a light pointed at an object move along with the object. Combine this with Typistry's animation features, and you can create a spotlight that follows a moving object. StrataType 3d lets you create an unlimited number of light sources, each of which can have gels. StrataType 3d even lets you create your own custom gels.

For creating animations (a capability StrataType 3d lacks), Typistry uses a simple keyframe scheme: Move an object or a light, choose Next Keyframe, and then repeat the process. Typistry calculates the intermediate frames for you.

You can save a final image in PICT, EPS, or TIFF formats. TIFF files can have an optional alpha channel — valuable if you plan to further modify the image in a program such as Adobe Photoshop.

As for StrataType 3d, versions 2.0 and later fix most of the shortcomings of the first version — although animation isn't provided. StrataType 3d now supports an unlimited number of light sources, which can have gels. The program also provides a kerning feature, an optional alpha channel, more control over textures, and improved rendering quality.

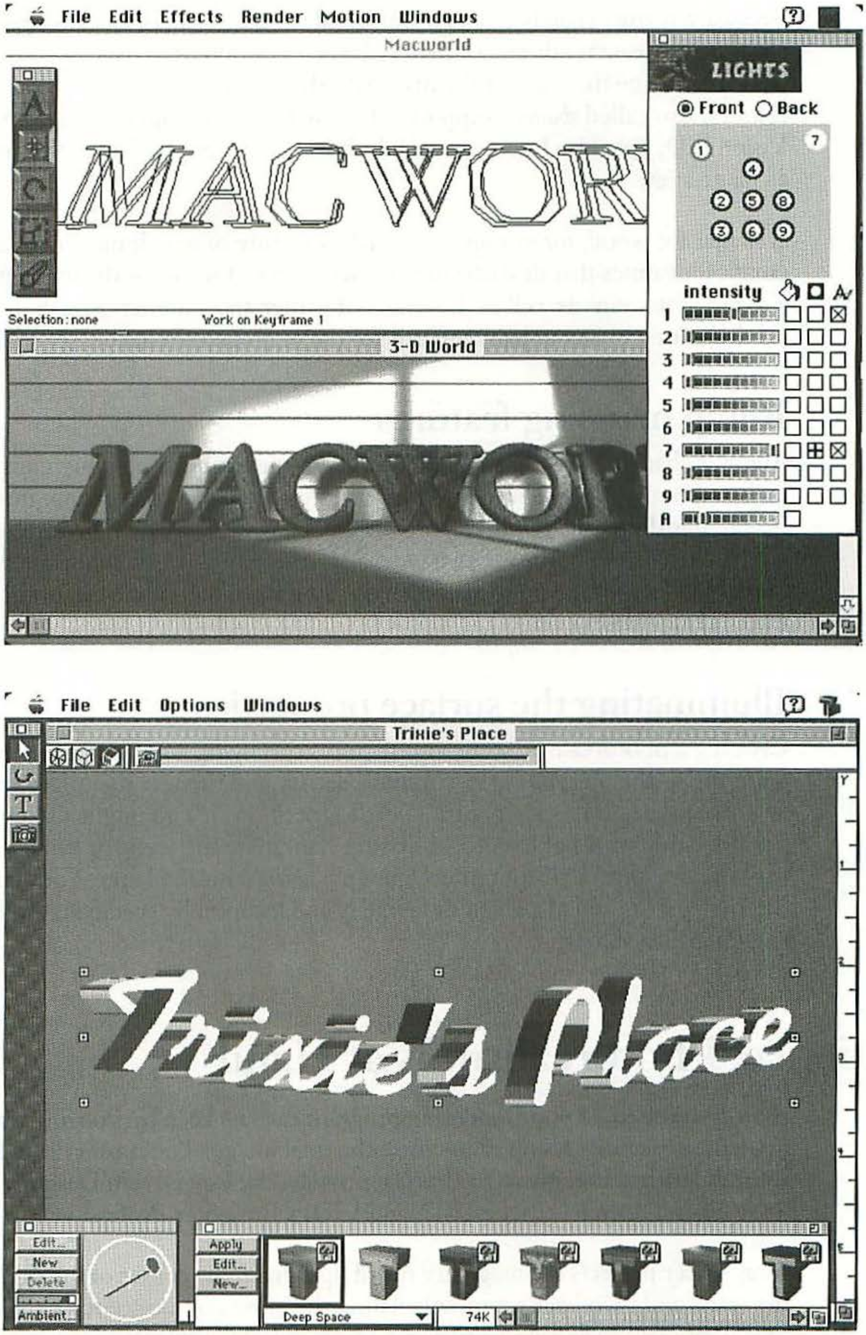


Figure 15-3: Text on a 3-D Stage Typistry's object window (top) lets you move, resize and rotate objects. The Lights palette at right graphically shows each light's position and intensity settings. The window (below) shows an image rendered in Typistry's highest-quality setting. An example of StrataType 3d (bottom) is also shown.

Because a texture map is an electronic decal resting on an object's surface, it doesn't allow for realistic rendering of materials such as wood or marble, whose texture patterns change throughout the material's thickness. The answer — *procedural textures*, also called *shaders*, supported by Ray Dream Designer, Strata's Strata-Vision 3-D, Specular International's Infini-D, and Byte-by-Byte's Sculpt 3-D, to name a few.

A shader for wood, for example, isn't a 2-D picture of woodgrain; it's a set of mathematical routines that describe the characteristics of wood — the undulations and spacing of its veins as well as the colors of winter and summer growth. If you cut a solid-textured object in half, you can see the grain pattern inside.

Bump mapping features

Another characteristic that affects an object's appearance is its roughness: Bowling balls and oranges are spheres, but their vastly different surfaces cause them to reflect light differently. *Bump mapping* features give surfaces a 3-D roughness that would be grueling to model by hand. Most programs let you adjust the degree of bumpiness, allowing you to render everything from the nubs of an orange peel to the craters of the moon.

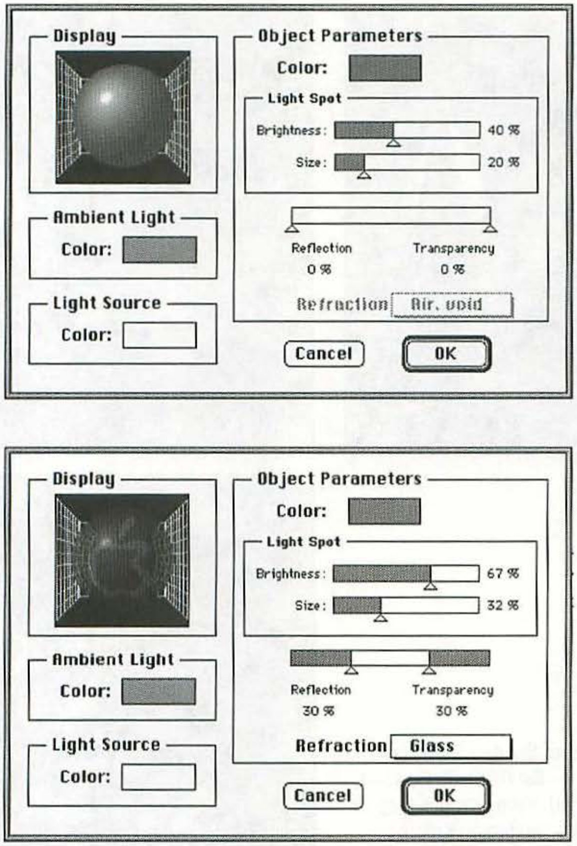
Illuminating the surface properties

Creating a photorealistic scene also requires specifying an object's *surface properties* — the object's degree of transparency and the way its surface reflects light and objects around it (see Figure 15-4 "Light Show"). You might also create and position additional light sources to better illuminate the scene or simulate a certain time of day. Alias' UpFront offers a unique feature for the latter: You can simulate the angle of the sun at a given time of day and location by specifying time, latitude, and longitude values.

Patience: Photorealism Is at Hand

Now it's time to let your rendering program earn its keep by slogging through the myriad calculations required to create the final image. The most calculation-intensive rendering technique is *ray tracing*, provided by Ray Dream Designer, StrataVision, Infini-D, Sculpt3-D, and VIDI's Presenter Professional.

A ray tracer projects an imaginary ray of light from the center of the camera into the scene and then back again, calculating the effects of the scene's light sources as they illuminate each object's surfaces, capturing highlights, shadows, and reflections. This process occurs for every screen dot (pixel) that will appear in the final image, so the larger the image, the longer you'll wait.



Brightness: 40 %
Size: 20 %
Reflection 0 %
Transparency 0 %
Refraction Air, void

Brightness: 67 %
Size: 32 %
Reflection 30 %
Transparency 30 %
Refraction Glass

Figure 15-4: Light Show Like most 3-D programs, Ray Dream Designer lets you modify an object's surface properties to simulate various materials. The preview (top) shows the program's preset values of no transparency or reflection. Reflection and transparency (bottom) have been modified. Note that the grid is reflected in the sphere, and an object (the Apple logo) is visible through the sphere.

Trading quality for speed

Faster but less realistic rendering techniques involve the use of shading routines (not to be confused with the shaders described earlier, which simulate solid textures). Figure 15-5 "Three Ways to Shade," illustrates the three most common shading techniques — *flat*, *Gouraud*, and *Phong*.

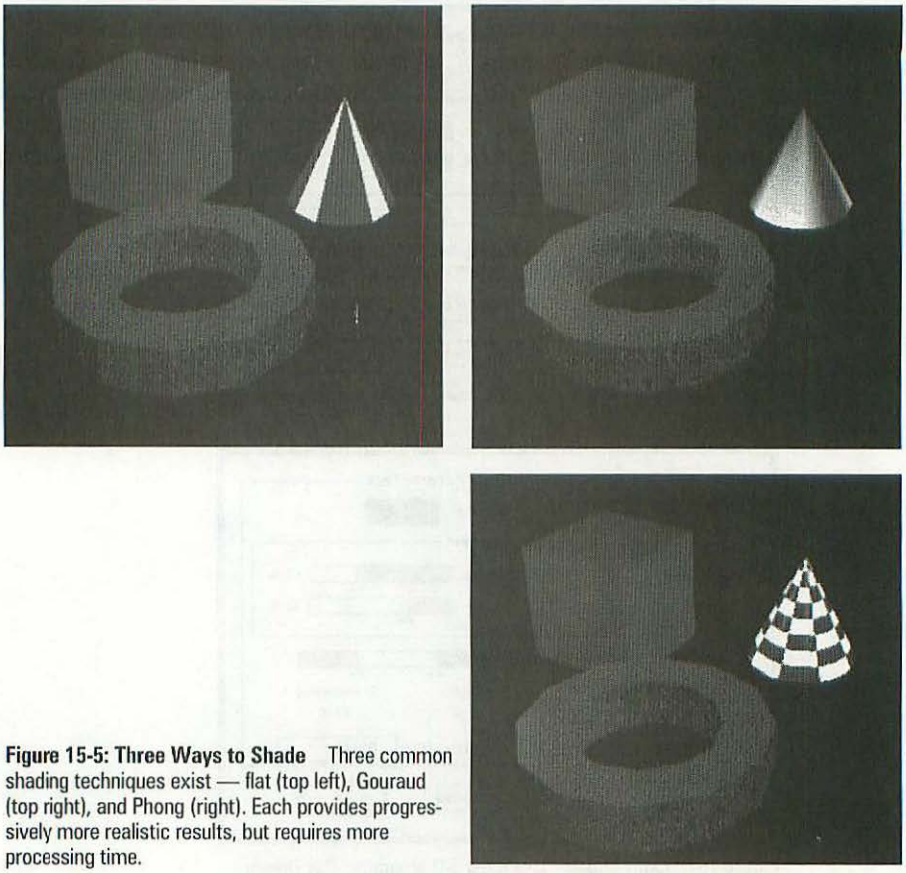


Figure 15-5: Three Ways to Shade Three common shading techniques exist — flat (top left), Gouraud (top right), and Phong (right). Each provides progressively more realistic results, but requires more processing time.

After you invoke your program's Render command (or its equivalent), sit back and wait for the final results. If you're running System 7 or System 6 MultiFinder and if the program can render in the background (most can), you can switch to a different program. But increasing your Mac's workload only slows down the renderer, so you may just want to go out for lunch.

Smoothing, saving, and printing

When the renderer completes its chores, you can save the results on disk, generally in PICT, TIFF, or EPS formats. You can also print images, although you need a high-end color printer or a film recorder to do justice to a full-color, ray-traced image.

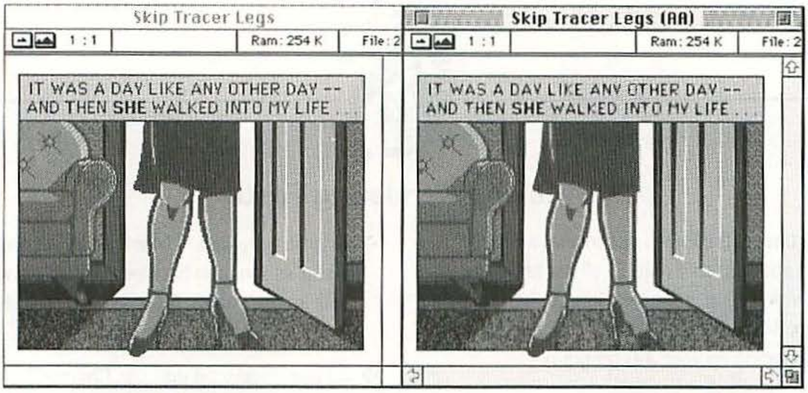

Skip Tracer Legs
1 : 1
Ram: 254 K
File: 2
IT WAS A DAY LIKE ANY OTHER DAY --
AND THEN SHE WALKED INTO MY LIFE . . .
Skip Tracer Legs (AA)
1 : 1
Ram: 254 K
File: 2
IT WAS A DAY LIKE ANY OTHER DAY --
AND THEN SHE WALKED INTO MY LIFE . . .

Figure 15-6: Jaggies Are Gone Ray Dream's JAG is an anti-aliasing utility that smooths the edges of 3-D art as shown before JAG (left) and after JAG (right).

Most rendering programs have anti-aliasing features that help eliminate the jagged edges that are common in computer-generated images. You can also fine-tune an image after it's rendered by putting it through Ray Dream's JAG utility. Its name is short for *jaggies are gone*, and it lives up to the moniker (see Figure 15-6 "Jaggies Are Gone").

The Adobe Dimension

Capable as most 3-D programs are, their final results are bitmapped images, which you can't resize without introducing distortion. As you saw in Chapter 13, bitmapped images are also tied to a specific number of dots per inch, so they aren't able to take full advantage of high-resolution output devices such as imagesetters and film recorders.

The object-oriented approach

Adobe Dimensions takes a different approach to 3-D — the vector, or object-oriented, approach. The end result of a Dimensions session isn't a PICT or TIFF file, but an Illustrator or Aldus FreeHand file. You can open this file in a variety of drawing programs and modify it — change its stroke and fill attributes, resize it, rotate it, disassemble it, and reshape it using the Bezier controls that are the foundation of PostScript-oriented drawing programs. Dimensions bridges the gap between the third dimension and PostScript drawing programs.

If you use Adobe Illustrator, you'll feel at home in Dimensions (see Figure 15-7 "Adobe's Third Dimension"). Dimensions provides a floating tool palette and

QUICK TIPS

Making Rendering Faster

They say time is the fourth dimension, and 3-D programs eat up plenty of it. Of all the tasks you can perform with a Mac, none take longer than rendering a complex 3-D scene. In this box, you can find some tips for speeding up your 3-D program.

Illuminate judiciously

Use only enough lights to get the effect you want. The more lights you create for a scene, the longer it will take to render, because your program will have to calculate shadows for each light. Too many lights can also make a scene look washed-out.

Create proofs to check your work

Calculating shadows and reflections are among the most time-consuming aspects of rendering. Most programs let you specify that an image be rendered without shadows and reflections. When you're in the initial stages of a project, use these options to create proof versions of a scene.

Most programs also let you render only a portion of a scene. When you do need to see shadows and reflections, consider rendering just the portion of the scene containing them.

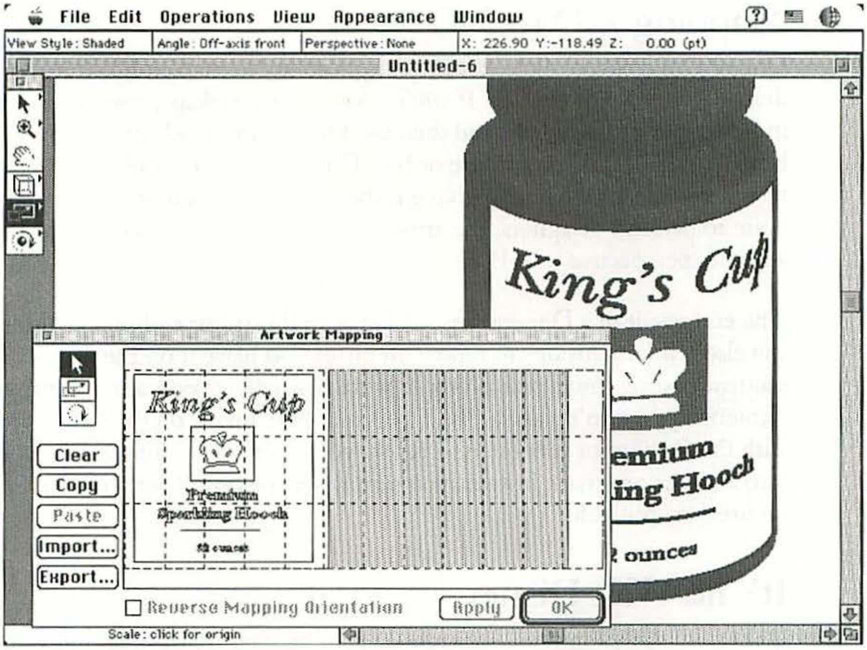
Upgrade your Mac

It may be stating the obvious, but the faster your Mac, the faster your 3-D program. Several types of upgrades can improve rendering performance.

- *More memory* You can speed up most rendering programs by allocating more memory to them using the Finder's Get Info command as described in Chapter 23. Avoid using System 7's virtual memory feature: It will slow the program, not speed it up.
- *A faster hard disk* Most rendering programs swap information between memory and a hard disk as they work. A faster hard disk allows those swaps to occur more quickly.
- *An accelerator board* As Chapter 31 explains, an accelerator board boosts performance by replacing your Mac's processor with a faster one.
- *A rendering accelerator* A general-purpose accelerator will boost your Mac's overall performance. But for top rendering performance, consider a rendering accelerator such as Yarc Systems' NuSprint or MacRageous II, both of which use high-speed RISC processors. Most major 3-D programs are available in versions that support the NuSprint or MacRageous II cards. You can boost performance even more by using multiple cards.

Consider network rendering

Network rendering involves dividing a rendering job across a network of Macs, with each Mac handling a portion of the image. This rendering team effort is sometimes called *distributed rendering.* Several rendering packages, including Ray Dream Designer and MacRenderMan, are available in versions that support network rendering. You can also use one or more Radius Rocket accelerators in combination with Radius' RocketShare to set up a distributed rendering system on a single Mac. Before taking the network rendering approach, however, investigate a RISC card such as Yarc's MacRageous, which has the potential to provide better performance and reliability.



View Style: Shaded
Angle: Off-axis front
Perspective: None
X: 226.90 Y:-118.49 Z: 0.00 (pt)

Figure 15-7: The Adobe Dimension Dimensions' artwork mapping window lets you apply an Illustrator or FreeHand file to a 3-D object. Here, a label created in Illustrator is applied to a bottle.

bottom-of-the-window information bar that work similarly to their Illustrator counterparts, as do Dimensions' tools for scaling and rotating.

Dimensions is designed to be used with Illustrator or FreeHand: It isn't very useful by itself. To create 3-D objects other than spheres, cones, and cubes, you must draw 2-D versions of them in Illustrator or FreeHand and then import the file into Dimensions. You can then extrude the shapes or revolve them. Extrusion adds depth to an object's boundaries, while revolving spins an object around one axis — as though you're turning a block of wood on a lathe. You can rotate 3-D objects using Dimensions' trackball tool or by typing specific rotation values.

One of the most fun aspects of working with a conventional 3-D program is giving objects surface textures such as marble, stucco, or red bricks. Dimensions doesn't support these kinds of textures — understandable, considering that textures are essentially bitmaps and Dimensions is an object-oriented program. Dimensions is limited to creating smooth surfaces with finishes ranging from matte to glossy. When you use Dimensions' rendering commands to generate the 3-D image, the program creates PostScript blends that simulate shading and depth.

As for lighting your 3-D world, Dimensions lets you create any number of light sources and specify their position and intensity. All lights produce white light. Adobe says supporting colored lights would be very complex in Dimensions' process-color, PostScript-oriented world.

Mapping 2-D to 3-D

One of Dimensions' slickest features is its ability to map an Illustrator or FreeHand drawing onto a 3-D surface. If you're designing a package, you can create its label in Illustrator or FreeHand and then use Dimensions to electronically apply the label to a shape such as a bottle or box. Dimensions accurately retains the characteristics of the art while also giving it the appropriate perspective. Besides being a boon to package designers, the artwork-mapping feature also makes it easy to add accurate perspective to 2-D art.

The end result of a Dimensions session is an Illustrator or FreeHand file, but you can also tell Dimensions to render an image and place it on the Clipboard for subsequent pasting into a publishing or word processing program. Unfortunately, Dimensions doesn't place a PICT version of the image on the Clipboard along with the PostScript version. As a result, you can't see the image once you paste it into another program; instead, you simply see the text "PostScript on Clipboard — no preview available."

It's no Walt Disney

Dimensions has a limited animation capability: Specify the beginning and ending attributes for a shape, and Dimensions generates the in-between frames and saves each as an Illustrator file. Unlike Pixar's Typistry and many conventional 3-D programs, Dimensions can't create QuickTime movies. You can, however, create a movie by importing the Illustrator frames into Adobe Premiere (discussed in Chapter 21).

If you're used to working with conventional 3-D programs, you may think Dimensions is very limited, what with its white-only light and no surface texturing. Only when you realize that Dimensions performs its 3-D illusions within the object-oriented, resolution-independent world of PostScript does it hit home that this is a groundbreaking program. Dimensions is an excellent 3-D tool for anyone who works extensively in Illustrator or FreeHand.

Choosing a 3-D Program

Should you use an all-in-one program such as Infini-D or StrataVision? Or should you combine a modeler with a standalone renderer such as MacRenderMan?

One advantage to combining separate programs is that you can tailor your 3-D toolbox to your tastes. But there are drawbacks, too, not the least of which is that you'll probably spend more. A more serious problem is that one firm's renderer may not accurately import another's models.

File exchange formats

One common file format for exchanging models is called DXF. Another is Pixar's RenderMan Interface Bytestream, or RIB, format. The RIB format was designed by Pixar to be a standard format that lets you use any RIB-compatible modeler to create models that are then rendered with the MacRenderMan rendering software.

Many 3-D programs support DXF and RIB files, but there's no guarantee that each adheres exactly to the DXF or RIB standards. If you're considering combining separate 3-D modeling and rendering programs, ask their developers if they know of any file compatibility problems. And remember that switching between different programs isn't as fast or convenient as using an all-in-one program.

Try before you buy

Because 3-D programs are so complex, I recommend trying a few before buying one. Most developers offer demo packages that include scaled-down versions of their programs, videotape demonstrations, or both. They're an inexpensive way to sample 3-D.

That 3-D graphics programs are difficult to learn is no reflection on their designers. Simulating the real world is not an easy job. But if you can make a 3-D program earn its keep — and if you invest the time required to master it — you can find new ways of looking at your design jobs. Working with a good 3-D program can also give you new appreciation for light, shadows, textures, perspective, and all of the other phenomena that contribute to that mental miracle called sight.

CHAPTER 15 CONCEPTS AND TERMS

- Architects, artists, industrial designers, and graphics buffs are only some of the groups that can benefit from a 3-D graphics package.
- Many 3-D programs provide animation features that let you create walk-throughs and special effects.
- Creating a 3-D scene involves three basic steps — modeling (creating the scene's basic shapes and describing their surfaces); scene description (creating and adjusting light sources and choosing an angle and focal length for the program's electronic camera); and rendering (the time-consuming process in which the 3-D program calculates and creates the image's shapes, shadows, surface textures, and other characteristics).
- You can speed up image rendering by accelerating your Mac, adding a memory upgrade, or by buying a specialized rendering accelerator board.
- A 3-D program requires more time to learn than a conventional drawing program. Besides learning about lighting, textures, and rendering options, you need to adjust to the challenge of describing 3-D scenes within a 2-D space — the Mac's screen.
- Pixar Typistry and StrataType 3d are specialized 3-D programs that let you create 3-D text from TrueType or Type 1 PostScript fonts. Typistry can also create animations.

bump mapping
A feature that automates giving surfaces a 3-D roughness that would be grueling to model by hand.

camera
The vantage point from which a 3-D scene is viewed.

distributed rendering
Dividing a rendering job across multiple networked Macs: Each Mac handles a portion of the job, enabling the final image to be rendered faster.

extrusion
The process of creating a 3-D object by copying the *primitive,* moving the copy, and then adding edges to create a surface that connects the copy to the original.

hierarchical model
A model in which you lock one or more *child objects* to a *parent object.* If you are modeling a human figure, for example, you may use the torso as the parent object, and make the limbs and head child objects.

lathe
Also called *sweep,* a modeling feature in which you generally draw half of the object — a profile — the program rotates around an axis to create the 3-D object. You generally use a lathe feature to create objects with *radial symmetry* — goblets, bowls, baseball bats, doughnuts, doorknobs, and the letter *O.*

modeling
The process of drawing shapes, positioning them, attaching them to each other, and describing their surfaces and textures.

primitives
The basic shapes — circles, rectangles, polygons, and curves — used in a scene.

procedural textures
Also called *shaders,* mathematical routines that describe the characteristics of a material, such as wood.

ray tracing
A rendering technique in which the 3-D software projects an imaginary ray of light from the center of the camera into the scene and then back again, calculating the effects of the scene's light sources as they illuminate each object's surfaces, capturing highlights, shadows, and reflections.

rendering
The phase of a 3-D project in which the 3-D program grinds through myriad calculations to produce a final image based on the work you did during the modeling and scene description phases.

RenderMan Interface Bytestream
Abbreviated RIB, a file format for storing models that are rendered with Pixar's MacRenderMan software.

scene description
The process of creating and adjusting light sources and choosing camera angles and focal lengths.

surface properties
Everything about an object's surface — for example, its degree of transparency and the way its surface reflects light and objects around it.

texture mapping
Applying an image to a surface — as if you're applying a decal to a balsa model.

walk-through
A 3-D animation that simulates a trip through a space, usually a building.

wire frame
A fast rendering technique in which only the edges of objects are drawn.

CHAPTER SIXTEEN

Desktop Presentations

IN THIS CHAPTER

- Comparing presentation and publishing software
- Creating, sorting, arranging, and presenting visuals
- Projecting the Mac on a big screen
- Choosing slides, overheads, or the Mac itself as your presentation medium
- Tips and shortcuts for using Aldus Persuasion and Microsoft PowerPoint

Now and then, everyone dons a Willie Loman outfit and becomes a salesperson. Some sell products, others sell ideas and concepts. Whatever the wares, the steps are the same: You gather your facts, shine your shoes, and present your argument.

The Mac can't shine your shoes, but it can help with the rest of the process. Presentation software can help you refine your ideas and create presentation aids such as slides, overhead transparencies, and audience handouts. The whole process smacks of desktop publishing, and indeed, there are plenty of parallels between publishing and presenting. There are also significant differences.

In this chapter, I show you the world of presentation graphics software and hardware. I won't cover programs that provide extensive animation features here; for the scoop on animation and QuickTime-oriented presentation packages, see Chapter 21.

Present or Perish

Desktop publishing implies a permanence to your work: You're preparing documents that can be printed and kept — at least for a while. With presentation graphics, however, your efforts are often more transitory: Each visual is seen just briefly; then it's gone. Because of their fleeting nature, it's important to create visuals with impact and to plan your presentation so that your message sinks in.

ON THE CD

- Aldus Persuasion

Another key difference between desktop publishing and presentation graphics lies in the output media. With desktop publishing, your efforts rest on paper. With presentation graphics, your results are usually projected onto a screen, the most common types of output media being

35mm slides and overhead transparencies. The Mac itself is another medium: Using hardware I'll discuss later, you can project Mac screen images onto a large screen.

Combining text and graphics is something most Mac programs do with ease. So do you really need a presentation program? The truth is, if you make only one or two presentations a year, you can probably get by with a drawing program such as MacDraw II or MacDraw Pro, a spreadsheet program such as Microsoft Excel or Lotus 1-2-3, or a word processor or desktop publishing program. The ClarisWorks integrated package contains impressive presentation features, too. But if presentations are a regular part of your job, you need the specialized features of a presentation program.

Software to Present By

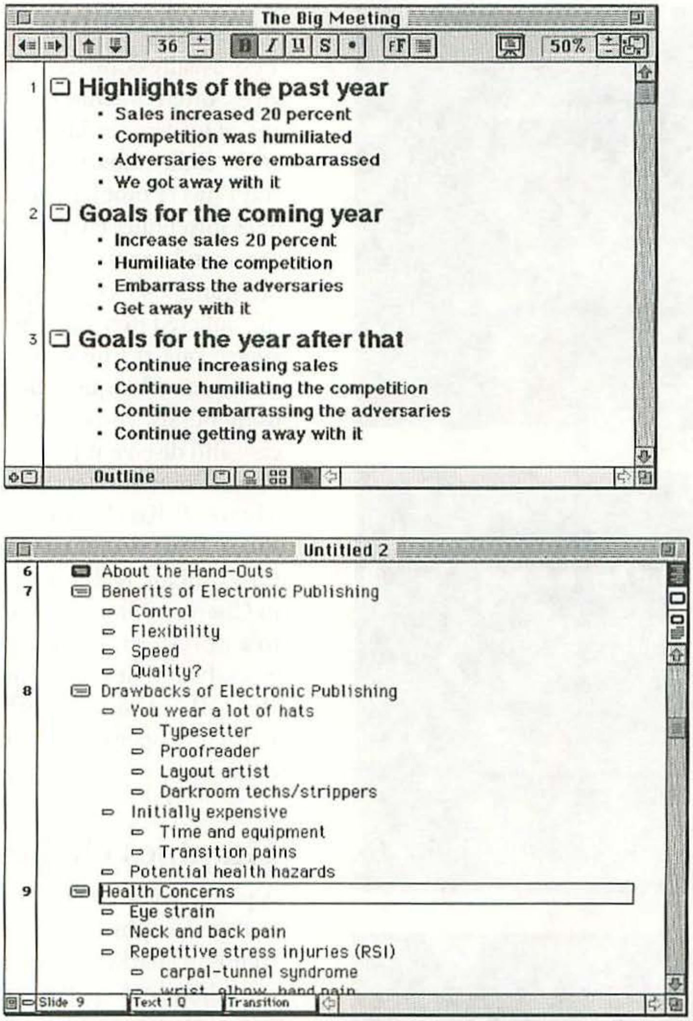
Word processors and publishing programs are generalists; presentation programs are specialists: Their text-editing and graphics-manipulation features are geared specifically toward producing presentation materials. Toward that end, most presentation programs play three primary roles: They help you develop and refine your ideas, create visuals, and structure and deliver your pitch.

When you're first developing a presentation, you need to organize and reorganize your ideas on the fly. Built-in outlining features, found in Aldus Persuasion and Microsoft PowerPoint, help you do just that (see Figure 16-1 "Outlining a Presentation"). If you use a program that lacks built-in outlining, team it with Symmetry's Acta Advantage outliner desk accessory, or do your brainstorming with a word processor that has outlining features.

Presentation programs encroach on word processing territory in other ways. Many provide search-and-replace commands for making wholesale changes to your text. And because typographical errors can turn a presentation into an embarrassment, you can find spelling checkers in Microsoft PowerPoint, Aldus Persuasion, and Claris MacDraw and ClarisWorks. But remember, spelling checkers aren't usage checkers. They don't know *capital* from *capitol* or *its* from *it's*, so keep your dictionary handy.

Visual Components

After you've refined your ideas, you're ready to produce visuals, which can contain three basic elements: text, graphics, and backgrounds.



1 Highlights of the past year
- Sales increased 20 percent
- Competition was humiliated
- Adversaries were embarrassed
- We got away with it

2 Goals for the coming year
- Increase sales 20 percent
- Humiliate the competition
- Embarrass the adversaries
- Get away with it

3 Goals for the year after that
- Continue increasing sales
- Continue humiliating the competition
- Continue embarrassing the adversaries
- Continue getting away with it

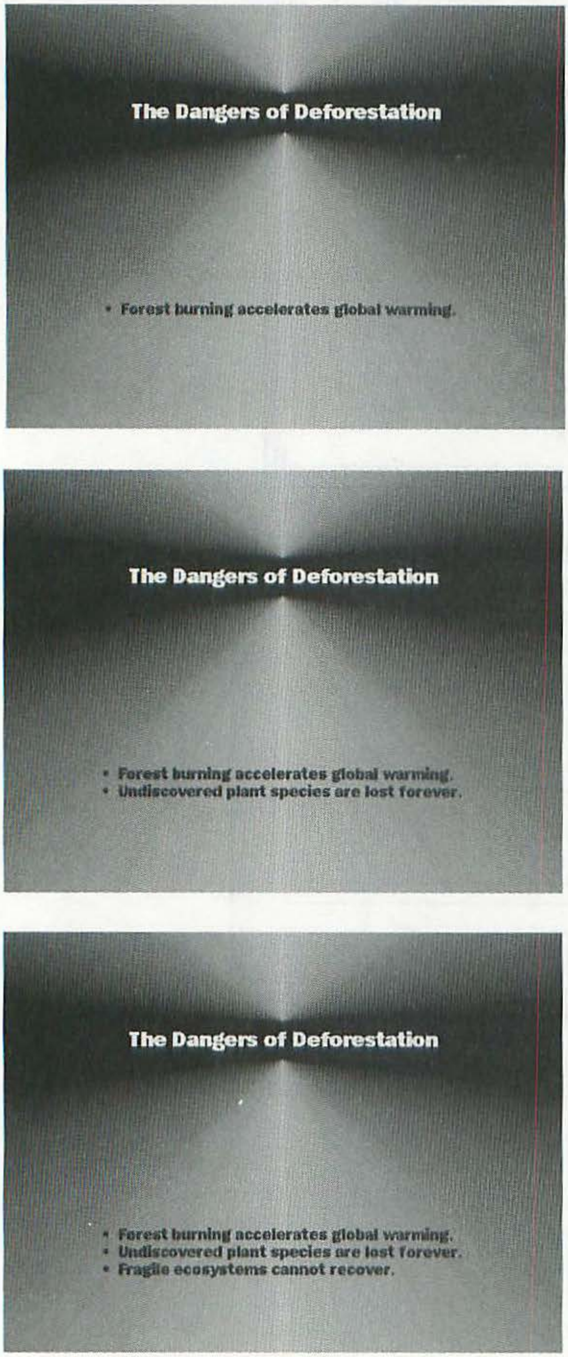
6 About the Hand-Outs

7 Benefits of Electronic Publishing
- Control
- Flexibility
- Speed
- Quality?

8 Drawbacks of Electronic Publishing
- You wear a lot of hats
  - Typesetter
  - Proofreader
  - Layout artist
  - Darkroom techs/strippers
- Initially expensive
  - Time and equipment
  - Transition pains
- Potential health hazards

9 Health Concerns
- Eye strain
- Neck and back pain
- Repetitive stress injuries (RSI)
  - carpal-tunnel syndrome
  - wrist, elbow, hand pain

Figure 16-1: Outlining a Presentation Microsoft PowerPoint (top) and Aldus Persuasion (bottom) offer built-in outlining features that let you organize your thoughts before creating visuals. Both can turn outlines into bullet charts with one command or mouse click.



The Dangers of Deforestation

- Forest burning accelerates global warming.

The Dangers of Deforestation

- Forest burning accelerates global warming.
- Undiscovered plant species are lost forever.

The Dangers of Deforestation

- Forest burning accelerates global warming.
- Undiscovered plant species are lost forever.
- Fragile ecosystems cannot recover.

Figure 16-2: Bullet Charts Bullet charts present their information in short phrases, organized in bulleted list form. Many presentation programs let you specify that the bulleted items in a list appear one at a time on consecutive visuals, as shown here. This technique is called a build.

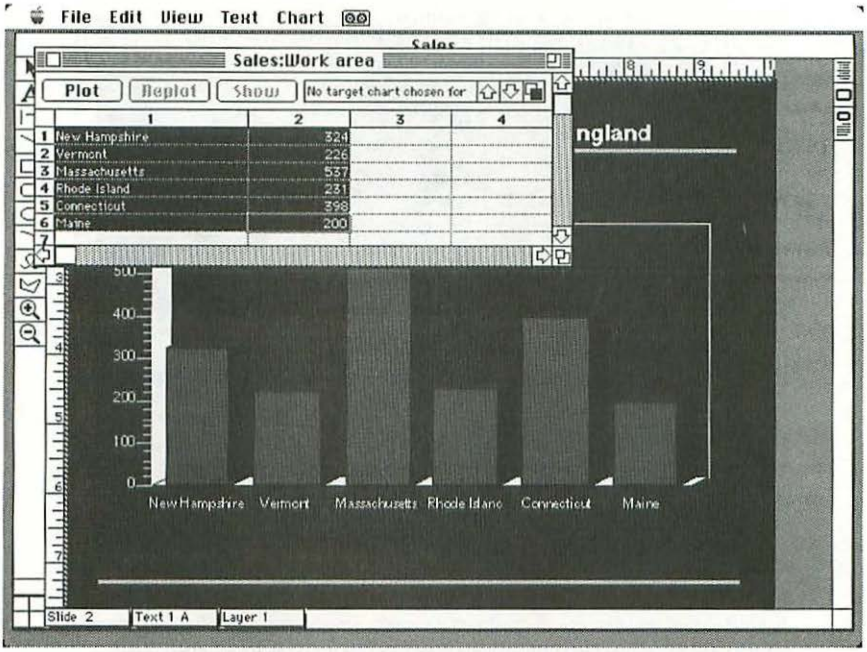
Text elements

Text usually consists of short passages, often organized as bullet charts for fast reading (see Figure 16-2 "Bullet Charts"). Persuasion and PowerPoint let you turn outlines into bullet charts with one command or mouse click. Many programs also let you specify that the bulleted items in a list should appear one at a time on consecutive visuals, a technique called a *build.* By using builds, you can make your case and discuss it point by point. PowerPoint also lets you include Microsoft Excel worksheets in slides. PowerPoint uses Microsoft's OLE linking technology (discussed in Chapter 28) to let you link a slide to a worksheet: Double-click a worksheet that you've imported into PowerPoint, and PowerPoint starts Excel and opens the worksheet for editing.

Graphics elements

A picture is often worth a thousand bullets. Graphs can visually depict trends or market shares, organization charts can spell out the corporate pecking order, and diagrams and drawings can illustrate complex concepts. Persuasion provides built-in graphing features that let you create graphs from numerical data that you type in or import from a spreadsheet (see Figure 16-3 "Built-In Graphing").

PowerPoint includes a separate graphing program, Microsoft Graph, which I discussed in Chapter 13. Other programs let you



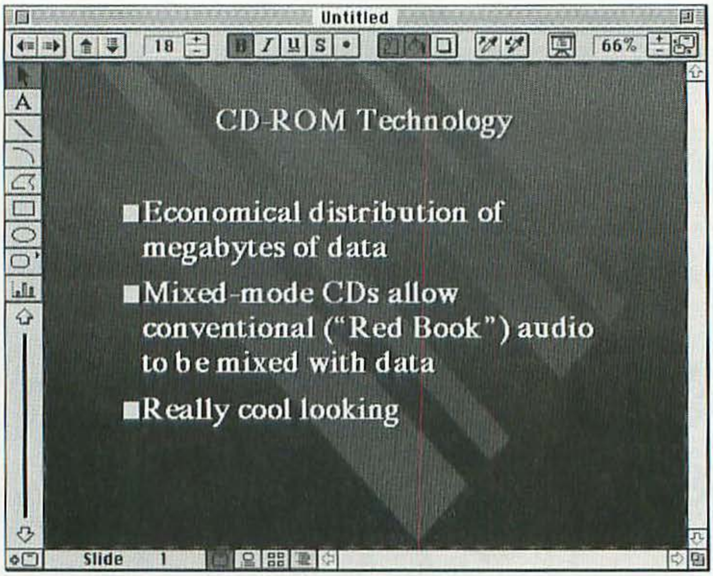
	1	2	3	4
1	New Hampshire	324		
2	Vermont	226		
3	Massachusetts	537		
4	Rhode Island	231		
5	Connecticut	398		
6	Maine	200		
7				

Figure 16-3: Built-in Graphing Persuasion provides built-in graphing features that let you create graphs from numeric data that you type or import from a spreadsheet. A 3-D bar chart is shown here.

import graphs created in other programs such as Excel, but that isn't as convenient. As for other types of graphics, Persuasion can automatically generate organizational charts based on the indent levels in an outline. All presentation programs have drawing tools for making diagrams, and most can also import images created with a scanner or a drawing program. Persuasion and PowerPoint presentations can also incorporate QuickTime movies.

Background elements

On printed documents, text and graphics generally appear against the white background of paper. But presentation visuals are usually projected onto a white screen in a darkened room, and in that setting dark text against a white background is hard on the eyes. It's better to use white or brightly colored text against a dark background. All presentation programs let you specify such schemes. Many also provide special background effects that give visuals an elegant, professional look (see Figure 16-4 "The Right Background").



CD-ROM Technology

- Economical distribution of megabytes of data
- Mixed-mode CDs allow conventional ("Red Book") audio to be mixed with data
- Really cool looking

Figure 16-4: The Right Background Most presentation programs provide canned templates that you can use to create your visuals. These templates often include a selection of attractive backgrounds, such as this one from Microsoft PowerPoint.

Drawing and layout features

For assembling these components, presentation programs provide drawing and layout features that let you position text, create boxes and borders, paste graphics created in other programs, and draw various shapes. Most also provide on-screen rulers and alignment guides for precise positioning.

True, these features are all found in publishing and drawing programs. But presentation programs put a different spin on many of them. For example, publishing programs don't know overheads from slides, but presentation programs provide page-setup options for both. Thus, instead of having to calculate the proper dimensions for a slide or overhead and then type them into a Page Setup dialog box, you simply choose your output medium from a dialog box.

Consistency is everything

A presentation is more effective if its visuals are designed with care. Well-designed visuals use a consistent background and color scheme, and have a uniform layout to give the viewer's eye familiar points of reference. One way to achieve this continuity is to repeat a company logo or graphic on each visual. Most presentation programs let you store such repetitive elements on a *master slide* (see Figure 16-5 "Master Slides").

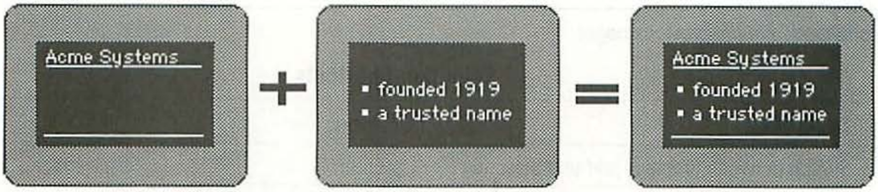


Figure 16-5: Master Slides Presentation programs use master slides to hold elements that repeat on each slide, such as a company logo, a set of lines, or a background. The contents of a master slide are combined with each individual slide to create a composite containing both the text and graphics.

For typographic consistency, many programs also provide word processor–like style features that let you store and recall text formats. Persuasion, PowerPoint, and MacDraw let you create templates to store your formatting preferences for future use. These programs also include an assortment of attractive predesigned templates.

Descriptive titles

Most presentation programs let you assign descriptive titles to each visual in a presentation, so you can tell at a glance what the slide or transparency contains. You can also use these names to sort and organize the visuals using your program's sorting features.

QUICK TIPS

Keyboard Shortcuts for Microsoft PowerPoint

The tables in this box list some handy keyboard shortcuts for Microsoft PowerPoint.

Navigation Shortcuts

To Do This...	*Press...*
Display the next slide	Page Down
Display the previous slide	Page Up

(continued on the next page)

(continued from the previous page)

Selection Shortcuts

To Do This...	***Press...***
Switch between graphics and text selection	Enter
Select the next object	Tab
Select the previous object	Shift-Tab
Select text	Shift and an arrow key
Add to or subtract from the selection	Shift-click

Dragging and Resizing Shortcuts

To Do This...	***Do This...***
Constrain movement vertically or horizontally	Press Shift while dragging
Ignore grids and guides	Press ⌘ while dragging or resizing
Duplicate	Press Option while dragging
Constrain resizing	Press Shift while resizing
Resize from the center of an object	Press Option while clicking a resizing handle
Restore shape	Double-click a resizing handle

Text-Editing Shortcuts

To Do This...	***Press...***
Create a new paragraph	Return
Create a new line in a paragraph	Shift-Return
Move the insertion point one word at a time	Option-left arrow or Option-right arrow
Move the insertion point one paragraph at a time	Option-up arrow or Option-down arrow
Increase font size	⌘-Shift-period
Decrease font size	⌘-Shift-comma
Raise baseline	⌘-Shift-Option-period
Lower baseline	⌘-Shift-Option-comma

Navigation Shortcuts

To Do This...	***Press...***
Move to the next body object or title object	Option-Return
Promote paragraph	⌘-Option-left arrow
Demote paragraph	⌘-Option-right arrow
Move paragraph up or down	⌘-Option-up arrow or ⌘-Option-down arrow

Sorting and Showing

What ultimately separates presentation programs from most of their publishing and drawing kinfolk are features that let you sort and arrange visuals and present them using the Mac's screen.

People who work with slides often use an illuminated stand called a slide sorter to view and organize their images. On-screen slide sorters — provided by PowerPoint and Persuasion — perform the same role by displaying numerous slides reduced to fit within a window (see Figure 16-6 "Sorting Slides").

Within the slide sorter window, you can change the sequence of slides in your presentation simply by dragging them to different positions. The slide sorter windows in PowerPoint and Persuasion also let you cut or copy slides to the Clipboard for pasting elsewhere in the same presentation or into a different one altogether. Most programs also provide title sorters that display only the slides' titles.

Slide show features

Finally, presentation programs provide slide show features to help you exhibit your visuals. Choose your program's Slide Show command, and the Mac becomes a projector, displaying each visual on the screen without the menu bar and tool

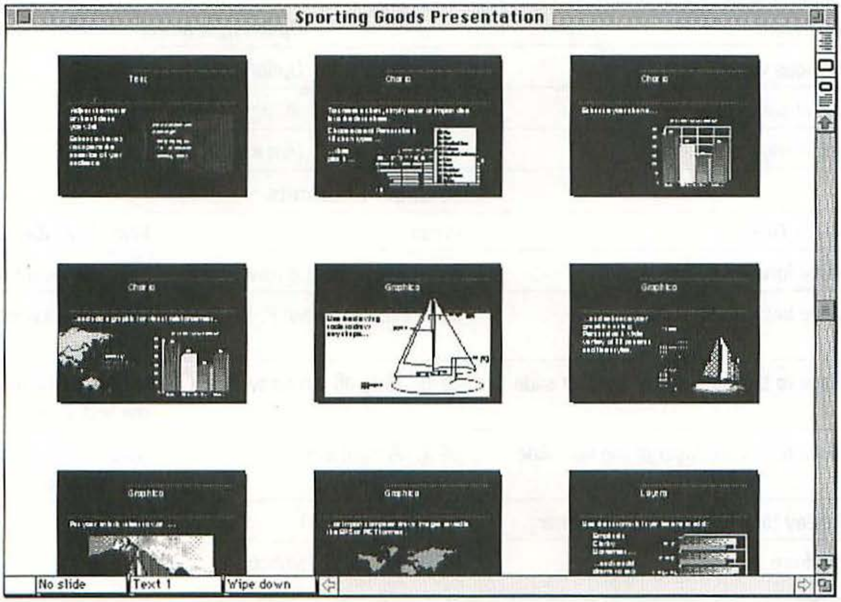


Figure 16-6: Sorting Slides PowerPoint and Persuasion (shown here) provide on-screen slide sorters, which display numerous slides reduced to fit within a window. You can reorganize the sequence of the presentation by dragging the visuals within the sorter window.

palettes. In slide-show mode, the mouse becomes a remote control: Click it to advance to the next visual. PowerPoint and Persuasion also let you use visual effects such as a *wipe*, which causes one visual to push the previous one off the screen.

QUICK TIPS

Keyboard Shortcuts for Aldus Persuasion

The tables in this box list some handy keyboard shortcuts for Aldus Persuasion. These shortcuts apply when the Word Processing option is selected in the Arrow Keys section of the Preferences dialog box. (Choose Preferences from the File menu to display the Preferences dialog box.)

View-Changing Shortcuts

To Do This...	***Press...***
Rotate between outline view and slide and notes view	⌘-period
Rotate between notes view and slide and outline view	⌘-comma

Insertion Point Shortcuts

To Move to the...	***Press...***
Next word	Option-right arrow
Previous word	Option-left arrow
End of paragraph	⌘-right arrow
Beginning of paragraph	(not available)

Slide Show Shortcuts

To Do This...	***Press...***	***With Shift Key...***
Move forward by one layer	down arrow; right arrow; N; ⌘-3	Moves forward one slide
Move back to the previous slide	up arrow; left arrow; P; ⌘-2	Moves backward one layer
Move to the last layer of the first slide	⌘-H; ⌘-1; ⌘-left arrow	Moves to the first layer of the first slide
Move to the last layer of the last slide	⌘-4; ⌘-right arrow	Moves to the first layer of the last slide
Display (or hide) the mouse pointer	A; equals sign (=)	(same)
Exit from slide show	⌘-Q; ⌘-period; hyphen (-)	(same)

Swapping Mac and DOS PC files

If you use PowerPoint or Persuasion, you can even use a DOS PC to show presentations created on a Mac. Both PowerPoint and Persuasion have equivalent versions that run under the Microsoft Windows environment. You can transfer PowerPoint or Persuasion documents to the DOS PC using a floppy disk, network file server, or cable-transfer utility. (Chapter 28 shows how to swap files with DOS PCs.) Because of the differences between the two systems, you may have to fine-tune some formatting and visual transitions, so don't transfer your presentation moments before the big meeting begins.

Output Alternatives

And now for the output: Once you've created your visuals, how do you screen them for your audience? I've just mentioned the Mac-as-slide-projector technique. With this route, however, you may need some additional hardware — unless you can convince a roomful of people to crowd around your Mac.

Large-screen monitors

One option for owners of color Macs is a 19-inch color monitor. If you can spare about $8,000, you might consider one of Mitsubishi's gargantuan 37-inch color monitors, which are guaranteed to get noticed.

But giant monitors weigh and cost a great deal. And in a large room even a 37-inch screen can seem small. A more practical solution may be an LCD projection panel such as those offered by nView Corporation, Sayett Technology, In Focus Systems, Sharp Electronics, and others.

An AV Mac and a TV set or VCR

If you have an AV Mac such as Apple's Centris 660AV or Quadra 840AV, you can show a presentation on any television set that provides a composite or S-video input. (Most of today's so-called TV/monitors provide these connectors.) Connect the Mac's video-out connector to the video-in connector on the TV set, and then use the Monitors control panel to route the Mac's video signal to the television set as described in Chapter 21. Note that the outer edges of your visuals will be cut off unless you use the Monitors control panel to specify a screen resolution of 512 by 384 pixels.

If you want to record the presentation on videotape, connect the VCR's video-in connector to the video-out jack of your television set. Or, connect the AV Mac's video-out jack to the VCR's video-in connector, and then connect the VCR's video-out jack to the TV set.

LCD projection panels

LCD projection panels work with an overhead projector. You plug the panel into your Mac and then lay the panel on the projector as though it were a transparency. The Mac creates a video image on the panel's liquid crystal display (LCD) screen, and the projector shows the image on the room screen. Some LCD panels create monochrome (black-and-white) images only, others support color. Some panels even contain memory into which you can load your visuals, eliminating the need to carry your Mac along.

Video projection

A better way to project color images is to use a video projector such as Sayett's Mediashow. Video projectors can create wall-size images with the same vivid color and fast screen updating you see on the screen. Many LCD projection pads include built-in projectors.

For some tips on getting the best results from an LCD projection pad or video projector, see the Quick Tips box "Projecting the Best Image."

Projecting the Best Image

Here are some tips for getting the best results from an LCD projection pad or video projector.

Use a high-quality screen

Don't project an image on a wall: You get more vivid colors and a brighter image if you use a screen. Matte-finish screens provide a wide viewing angle — good when your audience is spread out to the far sides of a room. Glass-beaded screens are brighter and have a fairly wide viewing angle, but they can be fragile. Lenticular screens have a relatively narrow viewing angle, but within that angle, the image is very bright and sharp.

Let your hardware warm up

Give a projection pad or video projector at least 20 minutes to warm up before you try to adjust its colors. And if you've just taken your hardware out of a cold car, let it adjust to room temperature so condensation won't form on its optics.

Ship the hardware carefully

Video projectors and projection pads are delicate. If your unit didn't include a hard carrying case, buy one. And avoid storing a unit in a hot car.

Overheads and Slides

The biggest drawback to most video-oriented presentation hardware is that you need to lug your Mac along. When portability, color, and economy are important, overhead transparencies and slides are better alternatives.

If you're like me, you probably slept through a few overheads in high school. Ah, but our teachers didn't have the output options we enjoy today. By printing your visuals on transparency film, you can produce impressive overheads that will do your teachers proud.

Overheads from your printer

For laser printers, use 3M Type 154 Transparency Film or its equivalent. (Generally, you can use any transparency film designed to withstand temperatures of 392°F or 200°C — the temperature present in a laser printer's fusing rollers.) For ink jet printers such as Apple's StyleWriter II or Hewlett-Packard's DeskWriter, use 3M CG3480 Transparency Film.

Need color? Use one of the new breed of affordable color ink jet printers, such as the Apple Color Printer or Hewlett-Packard's PaintJet series. Bigger budgets may spring for a printer such as QMS' PostScript-based ColorScript 210 or Tektronix's Phaser 200i. (See Chapter 32 for more details on color printers.)

Overhead drawbacks

Overhead transparencies are eminently portable: Dozens of them can fit in a binder and overhead projectors are almost as ubiquitous as photocopiers. But overheads have drawbacks, too. You must manually flip from one transparency to the next, and that can make an otherwise sophisticated presentation seem amateurish — especially if the projector's fan blows half your visuals off the table. (Don't laugh, it happens.)

What's more, overheads can scratch and smudge, and the hues produced by inexpensive color printers can't approach the vividness of the ultimate presentation output medium — the color slide.

Dazzling them with slides

Slides are portable, too, and you can carry them in a tray, where they're always properly sequenced and ready to show. Slides are also inexpensive to duplicate, so it's easy to prepare extra sets as backups or for colleagues. And slides give you the vivid colors that only film can provide. Slides also have the greatest dazzle potential. By combining two or more slide projectors under the control of a dissolve unit, you can create impressive presentations containing fancy visual effects (see the Background box "Professional Presentations").

BACKGROUNDER

Professional Presentations

Two slide projectors and a dissolve unit (available from photographic and audiovisual suppliers) give you the ability to create professional-looking presentations with special visual effects. When used with a dissolve unit, one projector's tray holds all even-numbered slides; the other holds odd-numbered ones. By alternating between projectors and fading the lamps in and out, a dissolve unit creates smooth transitions between slides, eliminating the jarring on-and-off flash between slide changes. By varying the speed of the lamps' fade-ins and fade-outs, the dissolve unit can create slow, graceful dissolves, or instant cuts.

The most sophisticated multimedia audiovisual applications combine dissolve units, multiple slide projectors, one or more motion picture projectors, and a multitrack audio tape recorder. One track of the audio recording holds inaudible pulses that control the dissolve units and projectors, while the remaining tracks hold narration, sound effects, and music.

Making slides with film recorders

To create slides with a presentation program, you need a film recorder such as GCC Technologies' ColorFast. A film recorder is a special kind of printer that creates images not on paper, but on film. Most film recorders contain a camera aimed at a video tube. Sandwiched between those components is a wheel containing red, green, and blue filters. The film recorder paints an image on the video tube, making separate passes for red, green, and blue light — three primary colors for video with which it can create a palette of over 16 million hues. A complete exposure usually takes a few minutes.

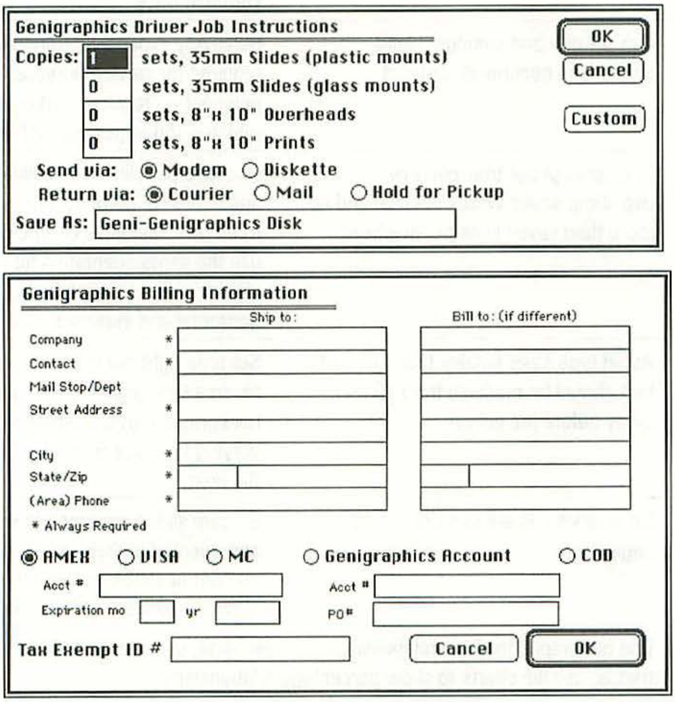
Not only do film recorders provide spectacular color, they offer tack-sharp resolution — usually in the ballpark of 4000 horizontal lines per slide. By comparison, a 14-inch color monitor displays 480 horizontal lines; commercial television has 525-line resolution.

Saving with service bureaus

Hardware this sharp isn't cheap: Film recorder prices generally start at about $6,000. A less expensive alternative is to use a slide-service bureau. Most cities have service bureaus and large copy shops that can create slides for you from documents you supply on a floppy disk. As an alternative, you can send a disk to a bureau or transmit your visuals via modem. Your slides arrive from one to several days later, depending on the turnaround time you are willing to pay for. Service bureaus also provide other types of output, such as high-resolution overhead transparencies and color prints.

Most publishers of presentation software have cooperative arrangements with nationwide slide-service bureaus such as Genigraphics. Included with the software is a driver for the type of film recorder the bureau uses. You copy the driver to your System Folder, and use the Chooser desk accessory to select it prior to creating your visuals. The driver provides straightforward dialog boxes that automate communications with the service bureau (see Figure 16-7 "Dialing for Dazzle").

For some tips on choosing between and designing slides and overheads, see the Quick Tips box "Presentation Pointers."



Genigraphics Driver Job Instructions

Copies:
1 sets, 35mm Slides (plastic mounts)
0 sets, 35mm Slides (glass mounts)
0 sets, 8"x 10" Overheads
0 sets, 8"x 10" Prints

Send via: ● Modem ○ Diskette

Return via: ● Courier ○ Mail ○ Hold for Pickup

Save As: Geni-Genigraphics Disk

Genigraphics Billing Information

● AMEX ○ VISA ○ MC ○ Genigraphics Account ○ COD

Figure 16-7: Dialing for Dazzle Most presentation programs include a driver that lets you transmit visuals to a nationwide slide-service bureau such as Genigraphics. Note the options for delivery time. With the Genigraphics driver shown here, after you press OK in the Print dialog box (top), a second dialog box (bottom) appears for you to enter payment and delivery information.

Presentation Pointers

You're scheduled to give a presentation. Which medium should you use — slides or overheads? And what typefaces would be best? Use the table below to help you decide.

	Overhead Transparencies	**Slides**
Best applications	Informal presentations to small groups	Formal presentations to large groups; repeating presentations at trade shows or public places
Advantages	Inexpensive; can be shown in lit room, allowing interaction; can be written on	Vivid colors; impressive looking; special effects possible with multiple projectors; easy to duplicate; remain sorted in trays
Disadvantages	Can scratch and smudge; bland colors; can become disordered	Relatively expensive; turnaround time required for service bureaus; less personal — requires darkened room, which discourages interaction
Design tips	One concept per transparency; use about seven words per line, and no more than seven lines per overhead	One idea per slide; use bulleted lists and *builds* for complex topics; avoid more than four lines of type per slide, use the same orientation for all slides — don't switch between horizontal and vertical slides
Typographic tips	Avoid type sizes smaller than 18 point; text should be readable from 10 feet away before projection	Set type tight but not touching; use reverse type (light type on dark background); avoid centering; avoid varying type size from one slide to the next
Presentation tips	Be sure visuals are in order before beginning	Be sure slides are properly sequenced and oriented in their trays; use a large number of slides — don't force the audience to stare at one image
Graphics tips	Use bar graphs to show relationships between data; use line graphs to show trends; use pie charts to show percentage relationships	
Typeface tips	Use bold, sans-serif fonts such as Helvetica Bold and Franklin Gothic Heavy; also consider the square-serif Lubalin Graph; don't use more than two typefaces per visual, and use the same typefaces throughout the presentation; for slides, use reverse type (light type on a dark background)	

Presentation Variations

Most presentation programs are geared toward brainstorming and producing visuals, but some specialized ones also deserve mention. For example, architects can use these programs to take clients on simulated walk-throughs of their designs, and industrial designers or interior decorators can allow clients to view their proposals from literally any angle.

3D, animation, and sound

Programs such as Visual Information's Dimensions Presenter enable you to create 3-D animated presentations. Programs such as Macromedia Director and Passport Producer can produce animated presentations that incorporate sound effects and music (see Chapter 21).

Then there's HyperCard. As a presentation program, Apple's software toolkit has serious limitations, most notably, limited color support. But it does provide a selection of visual effects and it can play back recorded sounds. And by combining its built-in programming language with on-screen buttons, you can create dynamic presentations that people can use and navigate through on their own. Macromedia Director provides superior animation and color features: It's a better choice for interactive presentations.

POWERBOOK ANGLE

Presentation Pointers for PowerBooks

A PowerBook is ideal for presentations. All PowerBooks except the 100, 140, 145, 145B, 170, and the PowerBook Duo models provide a connector to which you can attach an external monitor. You can then use the Portable Display control panel to put the PowerBook's video circuitry into video-mirroring mode. This causes the PowerBook to display the same image on the external monitor as appears on the PowerBook's display, enabling you to see your presentation without having to look behind you at the large screen. (When the PowerBook isn't in mirroring mode, the external monitor extends the Mac's desktop.)

If you have a PowerBook that lacks a built-in monitor port, you can add external video support using a third-party upgrade such as Computer Care's BookView Imperial or Invisio's Notebook Display Adapter, or by attaching a SCSI-based monitor to the PowerBook's SCSI port. A video card upgrade provides better performance — SCSI isn't fast enough for the demands of a real-time display. (See Chapter 31 for more details on video options.)

For PowerBook Duo models, consider buying a docking unit that provides an external video port. Apple's Duo Minidock provides one, as do several third-party docks. E-Machines' PowerLink Presentor even lets you use a TV set as a monitor.

All the help you can get

Before I began researching the world of presentation software, I was skeptical. The entire category struck me as being one created by software companies looking for another way to sell programs that provide drawing and layout features. But once I had worked with the programs a little and had seen what they're capable of, I thought of all the meetings I've snoozed through, where monotonal voices droned on and on in insomnia-curing conference rooms. Some interesting visuals and better planning certainly would have enlivened those proceedings.

It's true that a presentation program can spawn uninteresting visuals when used by a graphics philistine. And it's true that a presentation program's brainstorming features won't help someone in a mental drought. But it's also true that every day thousands of people stand up and try to sell their ideas and products to others. That's hard work, and when I'm in that spot, I'm glad to have all the help I can get.

CHAPTER 16 CONCEPTS AND TERMS

- If you give presentations only occasionally, you might consider using Claris MacDraw Pro or ClarisWorks, both of which combine drawing and graphics with basic presentation features. Frequent presenters will want to use a presentation program such as Aldus Persuasion or Microsoft PowerPoint.
- Visuals contain three basic elements — text, often organized into bullet charts; graphics, including graphs, organizational charts, diagrams, and drawings; and backgrounds, which spice up the visual and help make text more readable on a screen.
- Its features for sorting, arranging, and presenting visuals are what set a presentation program apart from a drawing or publishing package.
- Overhead transparencies, slides, and hand-outs are the most common forms of presentation hard copy. You can also use the Mac to display your visuals by using an LCD projection pad, a video projector, or a large-screen monitor.

build	A display technique in which the bulleted items in a list appear one at a time on consecutive visuals. By using builds, you can discuss each bullet point individually.
bullet chart	A series of text points, each of which is preceded by a bullet (•) or similar character.
dissolve unit	A device that connects two slide projectors and alternates between them to avoid jarring flashes of light between each slide.
film recorder	A hardware add-on that lets you create 35mm slides.
LCD projection panel	A hardware add-on that uses a liquid-crystal display (LCD) enclosed in a frame that sits on an overhead projector, enabling the LCD's screen image to be projected.
master slide	A slide that holds the background and other elements that repeat on each slide.
slide show mode	An operating mode in which a presentation program hides the Mac's menu bar and windows, leaving only the visuals themselves. You can advance to the next visual by pressing the mouse button.
transparency film	A clear film that you can run through a laser or ink jet printer to produce visuals that can be projected using an overhead projector.
video projector	A hardware add-on that lets you project the Mac's screen image on a large screen.
wipe	A visual effect in which one slide appears to push the previous one off the screen.

CHAPTER SEVENTEEN

Telecommunications Basics

IN THIS CHAPTER

- Learning about modems and why your Mac needs one
- Introducing the town hall to the town mall with on-line services
- Looking at how the Mac has changed the face of on-line services
- Choosing on-line services that suit your needs
- Using America Online and CompuServe
- Sending and receiving faxes

With some inexpensive hardware and software, your Mac can use a phone line to reach out and touch other computers. You can exchange files with a colleague at the office or a friend in another city. You can dial up *bulletin boards,* electronic meeting places for hobbyists and user group members. You can send *electronic mail* to friends and coworkers, even if they don't have computers. You can transmit documents to desktop publishing service bureaus for output on their typesetting equipment. You can subscribe to any number of *on-line services* from which you can access current news and vast libraries of free and nearly free software. You can send and receive faxes. And as Chapter 33 shows, with Apple's AppleTalk Remote Access software, you can even dial into a Mac located somewhere else in order to copy files or print documents.

Computer bulletin boards and information services have been around for years, but until recently they didn't take advantage of the Mac's appealing graphics and easy operating style. Information services were designed to communicate with any brand of computer, and that meant forgoing the mouse and returning to the dark ages of typed commands such as cat/des/age:90/key:Mac.

That has changed. The Mac has inspired a new generation of communications services that you control using icons and all the other trappings of the Mac's graphical interface. Some clever programmers have also managed to graft friendly interfaces to older, text-oriented services. In this chapter, I explore the new look of Mac communications and what you need to go on-line.

ON THE CD

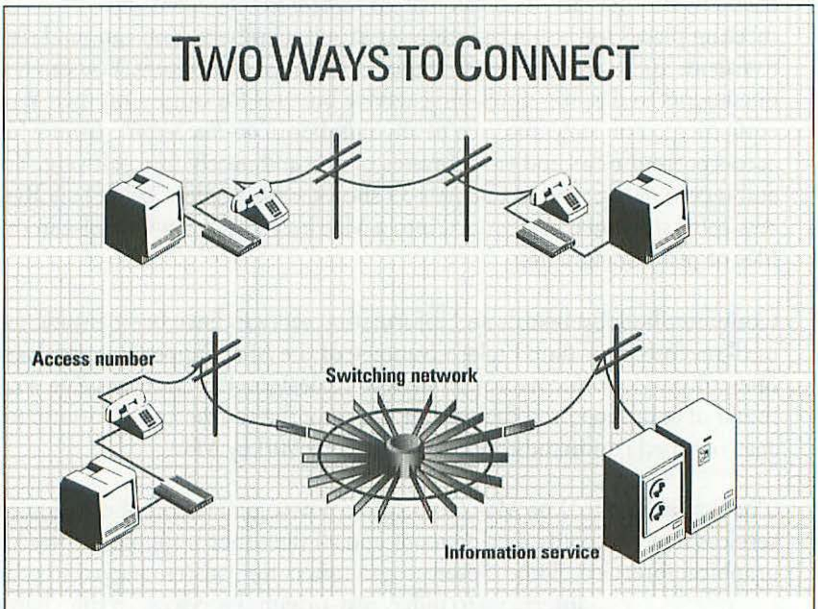
- FreeTerm, Zterm, and a BBS list (all in The Best of BMUG collection)

Private Lines and Party Lines

You can telecommunicate on two basic levels — directly with another computer (which may be anything from another personal computer to a Cray supercomputer), or through an intermediary such as an information service or bulletin board (see Figure 17-1 "Two Ways to Connect"). With the direct route, you arrange the communications session ahead of time by determining who will call whom, and then setting up your communications gear accordingly. A business traveler may use this technique to transfer a file to a colleague at the home office.

Communicating direct

Communicating directly costs only the phone call, but it forces you to contend with several communications technicalities, such as the choice of a *file-transfer*



One way to communicate is to call another modem-equipped computer directly (top). Most people, however, use information services as intermediaries. To connect to a service, you dial the *access number* closest to you to connect to a *switching network,* which, in turn, communicates with the service's computers. Some services operate their own switching networks, while others use commercial networks such as Telenet, Tymnet, and in Canada, Datapac.

Figure 17-1: Two Ways to Connect

protocol, which causes data to be electronically proofread to eliminate garbled files as it's received. Plan on making a troubleshooting call to iron out the wrinkles. Also plan for some scheduling predicaments: You and your fellow communicator should be at your machines to ensure that things go smoothly, and that's inconvenient if you're in different time zones.

Taking the timeshare route

An information service is a more convenient and more flexible way to communicate. When connected to one, your Mac talks to a room full of refrigerator-size mainframe computers. Those mainframes may, in turn, be talking to thousands of your fellow subscribers simultaneously, divvying up their time between each one. It's called *timesharing,* and it's one of the oldest ways of getting computer power to individuals and small companies. (Indeed, some on-line services, including CompuServe, began life years ago by selling mainframe computer time to businesses for payroll management and similar tasks.)

Information services, especially ones with graphical *front ends* — Mac software programs that help you access and navigate through the service — provide some insulation from the cold world of communications technicalities. And information? It's there in quantities that may overwhelm you at first and cost you a fair sum in connect charges after that.

Information, Please

An information service is a post office, library, stock broker, travel agent, meeting hall, computer club, and software flea market all rolled into one phone call. Here's what you can find on most services.

Electronic mail

You can exchange messages and disk files with other subscribers in a flash, and cut your express courier bills in the process. Simply *upload* files and messages to the service; recipients can *download* them at their convenience.

With many services, you can exchange *e-mail* with other subscribers only. Some services, however, provide *gateways* to other services. CompuServe and America Online users, for example, can exchange mail with MCI Mail subscribers. Other services, including MCI Mail and GEnie, can combine e-mail with paper mail: Transmit your message to the service, and it's laser printed and then mailed or delivered by courier. Most services can also send your e-mail to any fax machine.

News

Most services offer up-to-the-minute news from wire services such as Associated Press, United Press International, and Reuters; and from newspapers such as the *Wall Street Journal* and the *Washington Post.* The NewsNet information service specializes in government and industry news, offering the full text of hundreds of specialized newsletters. Most services let you locate items of interest by typing sets of keywords.

For example, the keyword phrase *offshore and regulation* would snag stories on offshore drilling laws. Some services also let you set up electronic clipping folders: Specify your keywords, and the service constantly scans the wires for you and saves stories containing them. When you go back on-line, you can find the relevant stories waiting.

Research

CompuServe has the largest electronic research room of all the major consumer information services. You can summon detailed information on nearly 10,000 publicly traded companies and demographic reports on thousands of towns and cities. Also available are data from the Bureau of the Census, transcripts of television news programs, thousands of articles from *Consumer Reports* and numerous computer publications (including *Macworld*), and on-line versions of *Books in Print* and *Who's Who.* On several services, you can find all ten million words of *Grolier's Academic American Encyclopedia.* There are also specialized research-oriented services such as NewsNet and Dialog.

Travel information

Most services have on-line travel agents that can help you plan trips. On CompuServe, you can search for fellow subscribers willing to swap houses for vacations. Frequent flyers can access the Official Airline Guide (OAG) database, the same flight-information service travel agents use.

Shopping

Yes, you can say "charge it" on-line. CompuServe and GEnie both have on-line malls containing music and video stores, florists, pharmacies, and cookie shops — everything except acres of asphalt and socializing teenagers. GEnie and America Online offer gateway access to Comp-U-Store, which offers member discounts on 250,000 products.

Special-interest forums

With special interest forums, you can communicate with other subscribers on a wide range of issues, including technical questions on using Mac hardware and software. You can also download megabytes of software, including fonts, scanned images, digitized sounds, utilities, desk accessories, and the latest version of the Mac's system software. Most programs are free, but some are *shareware.*

You're expected to pay a modest fee (usually under $25) if you decide to keep a shareware program. (You can find instructions for downloading shareware in the next chapter.) Most major software and hardware firms also operate forums, offering technical tips and program updates. All the major services have lively Mac forums, but CompuServe's is the largest.

Choosing a Service

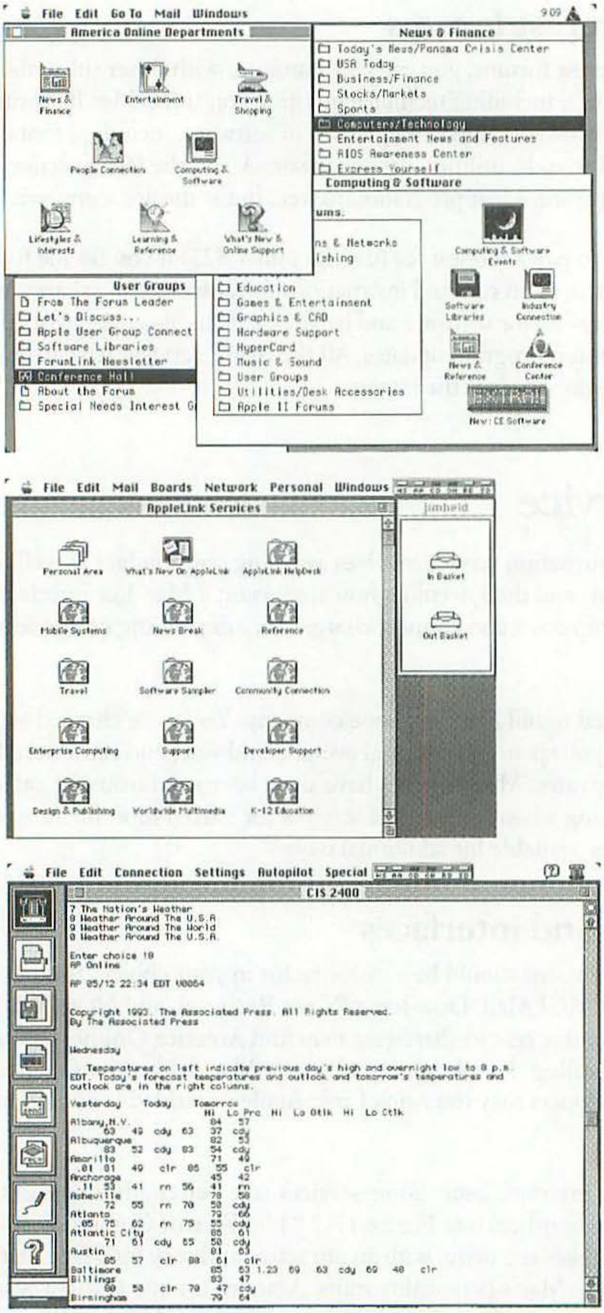
Choosing an information service involves assessing your budget as well as your information needs and then deciding how important a Mac-like interface is to you. Initial membership costs and connect charges vary depending on the service and when you use it.

Most services used to bill like the phone company: You were charged according to how much time you spent on-line, and evening and weekend rates were lower than daytime weekday rates. Most services have since borrowed from the cable TV industry by offering a basic package of services for a fixed monthly rate, with extra premium services available for additional costs.

Intentions and interfaces

Your on-line intentions should be a major factor in your choice. Business people may lean toward MCI Mail, Dow Jones/News Retrieval, and NewsNet, while Mac hobbyists who want access to shareware may find America Online, CompuServe, or GEnie more appealing. People who work in the Mac field as consultants, dealers, writers, and developers may use AppleLink, Apple's worldwide communications network.

Then there's the interface issue. Some services take better advantage of the Mac's operating style than others (see Figure 17-2 "The Face of Communications"). America Online takes the prize, with an attractive and easy interface that makes excellent use of the Mac's personality traits. America Online is also available for DOS PCs; the service looks and works the same on both Macs and PCs, making it a good choice for businesses that mix machines.



```
7 The Nation's Weather
8 Weather Around The U.S.A
9 Weather Around The World
0 Weather Around The U.S.A.

Enter choice 10
AP Online

AP 05/12 22:34 EDT V0064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By The Associated Press


Wednesday

   Temperatures on left indicate previous day's high and overnight low to 8 p.m.
EDT. Today's forecast temperatures and outlook and tomorrow's temperatures and
outlook are in the right columns.

Yesterday    Today    Tomorrow
                  Hi  Lo Prc  Hi  Lo Otlk  Hi  Lo Otlk
Albany,N.Y.        84   57
      63   49  cdy  63   37  cdy
Albuquerque        82   53
      83   52  cdy  83   54  cdy
Amarillo           71   49
  .01  81   49  clr  86   55  clr
Anchorage          45   42
  .11  53   41  rn  56   41  rn
Asheville          78   58
      72   55  rn  70   58  cdy
Atlanta            79   66
  .05  75   62  rn  75   55  cdy
Atlantic City      86   61
      71   61  cdy  85   50  cdy
Austin             81   63
      85   57  clr  88   61  clr
Baltimore          85   63 1.23  69  63 cdy  69  48  clr
Billings           83   47
      80   50  clr  70   47  cdy
Birmingham         79   64
```

Figure 17-2: The Face of Communications Three information services — the Mac-like America Online (top), Apple's AppleLink (middle), and CompuServe (bottom) as seen through the CompuServe Information Manager front-end program and a terminal-emulation program (Hayes' Smartcom II).

As for CompuServe, MCI Mail, Dow Jones, and GEnie, their interfaces are, well, not so pretty. All are text-oriented services that require typed commands in response to text menus. However, Mac *front-end* programs are available that graft a Macintosh interface onto these services. CompuServe's Navigator and CompuServe Information Manager programs provide point-and-click access to some (but not all) of the service's nooks and crannies. Neither Navigator nor CIM can compare to America Online or AppleLink, but they do provide alternatives to typing commands (see Figure 17-3 "CompuServe Makeover").

Matching services to your needs

My personal picks? If you want to subscribe to just one service, make it CompuServe. Its interface isn't the prettiest, but its range of services is unmatched. If an easy, Mac-like interface is important to you, choose America Online. America Online is a good choice for *Macworld* readers, too: *Macworld* has a forum on America Online called Macworld Online, where you can search through and read reviews and news stories from past issues of *Macworld* and exchange ideas with *Macworld* editors, contributors, and fellow readers.

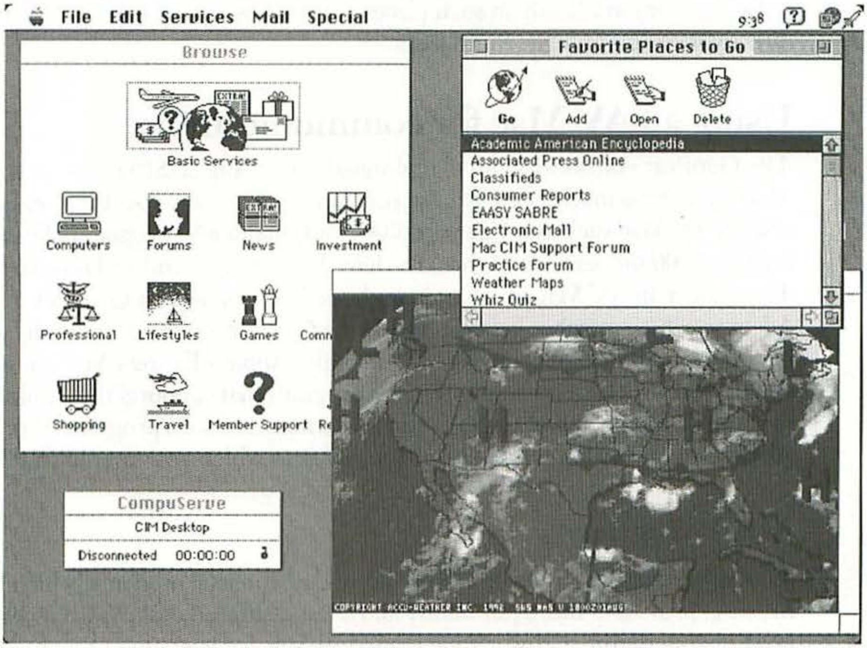


Figure 17-3: CompuServe Makeover The CompuServe Information Manager is a friendly facade for CompuServe. You choose menu commands and double-click forum names, and CompuServe Information Manager sends the commands that CompuServe expects to see. The program also offers a terminal mode that lets experienced users control CompuServe conventionally.

But limiting yourself to just one service is like reading only one newspaper or watching only one television station. Because you use the same hardware (and in some cases the same software) to communicate with each service, subscribing to additional services may not greatly increase your communications expenses.

Required Hardware

A computer's link to the on-line world is a *modem* (pronounced mow-dem). A modem converts, or modulates, the data coming from the Mac into audio tones that phone lines can carry, and demodulates the incoming tones into data the Mac can comprehend. Indeed, the word modem is a short form of the words MOdulate and DEModulate.

Direct connect modems

The most popular type in the Mac world, direct-connect modems attach between a phone jack and the Mac's modem or printer port, and also have an extra jack to plug into your telephone. *Acoustic modems* contain cups into which you snug a telephone handset. They're nearly extinct due to their susceptibility to background noise, but they are handy in such places as hotels, where phones are often wired directly instead of plugged into jacks.

Using an AV Mac for communications

The GeoPort connectors and digital signal processing (DSP) chips in Apple's AV Macs give these machines a head start in reaching out and touching other computers. An AV Mac such as a Centris 660AV or Quadra 840AV essentially contains a built-in 9600 bit per second (bps) modem that can also send and receive faxes. To connect an AV Mac to a standard phone line, you need a GeoPort Telecom Adaptor, which attaches between the Mac's GeoPort connector and the telephone line. The GeoPort Telecom Adaptor includes Apple's Express Modem software, which works with any communications program that supports the Apple Communications Toolbox (all of today's popular communications programs do). The adaptor includes a second RJ-11 phone jack into which you can plug a telephone.

Modems to go

The Mac PowerBook family can accommodate internal modems, which live inside the case, providing more portability and a less-cluttered desk. With its battery-powered operation, a PowerBook is an ideal Mac for keeping in touch. All Mac communication software runs on the PowerBook family. Where things differ is in the hardware: Apple offers two modems for the PowerBook family.

Macintosh PowerBook Internal Fax/Data Modem

This cleverly named modem works in most PowerBook models. (The modem was included with the PowerBook 170.) It's a 2400-bps data modem that can also send (but not receive) faxes. The modem includes somewhat limited but easy-to-use fax software. Select the Fax Sender icon in the Chooser desk accessory, and your programs' Page Setup and Print commands change to read Fax Setup and Fax. (***Tip:*** You can eliminate a trip to the Chooser by pressing the Shift and Control keys while opening a program's File menu. This temporarily changes the printing commands into faxing commands.) The Fax Setup command lets you specify paper size and orientation, enlargement or reduction, and fax quality; the Fax command lets you add and remove telephone numbers from a built-in directory and specify whether a cover page should be printed (see Figure 17-4 "PowerBook Faxing").

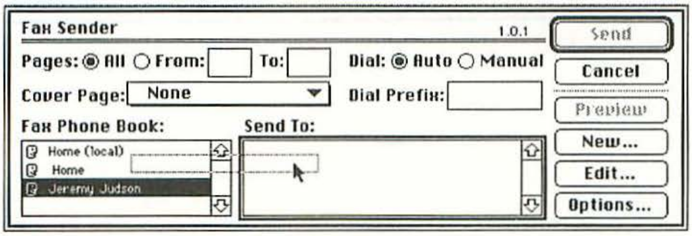
Macintosh PowerBook Express Modem Kit

This modem works in later PowerBook models, such as the 160, 165c, 180, and 180c as well as in PowerBook Duos. It costs a bit more than the above modem, but it's faster, supporting up to 14.4Kbps connections, and it can receive faxes as well as send them. The Express Modem is partially implemented in software; as a result, when the modem is active, it reduces the amount of free memory in your Mac by about 300K.

If you have a PowerBook Duo and you want a modem, you need to get the Express Modem. No third-party modems are currently offered for the Duo.

For all-in-one PowerBooks such as the 170 and 180, numerous firms offer internal fax/data modems that include better software than is included with the PowerBook Internal Fax/Data Modem. Global Village Communications' PowerPort series gets good marks for its high-quality software.

If you anticipate using your PowerBook for communications only occasionally and if you have other computers, consider buying a compact external modem. You will have one more piece of equipment to carry with you, but you'll also be able to use the modem with your other computers. (After connecting the modem, open the PowerBook control panel and select the External Modem option.)



Pages: ● All ○ From: To:

Dial: ● Auto ○ Manual

Cover Page: None

Dial Prefix:

Figure 17-4: PowerBook Faxing Sending a fax with the software that accompanies Apple's PowerBook Internal Fax/Data Modem.

POWERBOOK ANGLE

Tips for Mobile Modems

On the road with a PowerBook? Here are some survival tips to help you make and keep your connections.

Ask in advance about phone services

When making hotel reservations, ask if the hotel's phones provide connectors for portable computers. A growing number of hotel telephones contain so-called datalink ports — standard RJ-11 telephone jacks into which you can plug your PowerBook's modem cable. You may also want to seek out hotels that offer free local calls.

Don't forget your phone numbers

Another aspect of planning ahead involves making sure you have the local phone access numbers for the area to which you're traveling and the on-line services you'll be using. All on-line services have commands that list these numbers for you: Consider saving the list on your PowerBook's hard disk so you won't misplace it.

Connecting to hotel phones

If you're patronizing an as-yet unenlightened innkeeper whose phones can't accommodate your PowerBook, check to see if the phone is hard-wired into the wall. If it isn't, unplug it and plug your PowerBook modem into the wall jack.

If the phone is hard-wired, you may be able to make a connection by disassembling the phone's handset or wall outlet and connecting directly to the red and green wires within. (Don't try this unless you're comfortable working around wires: You can get an electrical shock, although phone line voltages aren't as dangerous as those inside a power outlet.) Radio Shack sells a cable with a male RJ-11 jack on one end and spade lugs on the other (catalog number 279-391). You can also make your own: Cut a standard RJ-11 cable in half and then strip the insulation off the red and green wires and connect an alligator clip to each one.

Dialing through a hotel system

Remember that most hotels require you to dial 8 or 9 to make an outside call. If you're using your modem's autodial capability, be sure to add the required prefix. Put a comma (,) between the prefix and the phone number you're dialing to tell your modem to wait a moment after dialing the prefix.

Carry an extension cord

Hotels have a tradition of putting power outlets in illogical or inaccessible places. If you plan to use your AC adapter with your PowerBook (and you'll probably need to: Using a modem drains the battery faster), bring along an extension cord, too.

After the call, save battery power

An internal modem uses battery power whenever a communications program is running. After you make your call, quit the communications program. Also keep in mind that a PowerBook won't go to sleep if its modem is in auto-answer mode.

Look for status lights

If you're shopping for an external modem, look for one that provides status lights. They aren't essential, but they can help you troubleshoot a sticky file-transfer session by showing when a connection exists and when data is being sent and received. Like a car without gauges, a modem without status lights doesn't tell you much when problems arise.

Watch your speed

Place of residence aside, the primary difference between modems is the speed at which they transfer data. Most modems transmit data at 1200 bits per second (bps) or 2400 bps. 9600-bps and even 14.4Kbps modems are available, but whether you should consider one depends on your communications tasks. Many on-line services support 9600-bps communications, but generally, only access numbers in urban areas support this fast rate. Connect charges are generally higher for 9600-bps operation, too, although the faster data rate often more than makes up for the extra cost. If you're thinking of a 9600-bps modem and your communications plans center around on-line services, be sure you'll be able to get high-speed access to your favorite services from your location. Similarly, if you plan to communicate directly with another computer user (that is, without using an on-line service), be sure the other user also has a 9600-bps modem before you buy. Otherwise, buy a 2400-bps modem.

If you plan to use Apple's AppleTalk Remote Access software or other remote network access software, buy the fastest modem you can afford. But for general-purpose communications, a 2400-bps modem is your best bet. (For some background on how modems transfer data and how their speed is measured, see the Background box "Bits and Bauds.")

Compatibility and price

Although the industry standards are the ruggedly built (and pricey) Hayes Ultra series by Hayes Microcomputer Products, you'll probably do just as well with a less expensive modem — perhaps one from Hayes' more-affordable Optima line. Just make sure any modem you're considering is fully Hayes-compatible — it understands the Hayes command set of dialing and connection commands. This command set is also often called the *AT command set.*

A modem's price depends on its speed and brand. Hayes-compatible 2400-bps modems from firms such as Prometheus Products, Anchor Automation, and Practical Peripherals often sell through mail-order firms for well under $200. A 9600-bps modem can cost about twice that. Some modems also include communications

BACKGROUNDER

Bits and Bauds

The speed at which modems exchange data is measured in terms of *baud rate,* also called *bit rate.* Any character on the Mac's keyboard can be represented by a combination of eight bits, or a *byte.* Internally, the Mac shuttles these bits between memory and microprocessor and disk drives in *parallel:* The eight bits travel alongside each other, each in its own wire, like marchers in a parade striding eight abreast. When conversing with a modem or printer, however, the Mac sends bits in *serial form* — one bit after another, in single file, like commuters threading through a subway turnstyle.

To show the computer at the other end of the line where one byte ends and the next begins, a communications program adds extra bits, a *start bit* and a *stop bit,* to the eight bits in the byte itself. This means that it takes roughly ten bits to send one character. One baud equals one bit per second, so you can calculate how many characters a modem sends per second by dividing the bit rate by ten. Many people prefer the acronym bps because baud is old-fashioned and less precise.

software, which tells the modem when to dial and hang up and helps you manage everything in between. If you have several Macs interconnected on a network, consider Shiva's NetModem, which can be shared by all the machines on your network (see Chapter 33).

When the Mac Meets the Fax

Numerous modems are available that do more than just modulate and demodulate. If you'd like to exchange faxes as well as files, you'll want a *fax modem* such as those offered by Dove, Supra, Zoom Telephonics, Cypress Research, Prometheus Products, and others. A fax modem lets you send documents you create to a standard fax machine without having to print the documents and run them through a scanning device. If you do have a scanner, you can scan hard copy and transmit the results using the fax modem, too.

Although most fax modems can receive faxes as well as send them, I prefer using a desktop fax machine for reception. For one thing, scanning a hard copy original before sending it is a lot of work compared to simply using a desktop fax. Also, leaving a Mac on for 24 hours a day wastes energy and shortens a hard drive's life. A typical desktop fax, however, uses only about 10 watts in standby mode — not much more than a nightlight. Finally, when a fax modem is receiving a fax, your Mac slows down distractingly.

The best use for a fax modem is sending documents that you create on the Mac. You get better quality because you don't have to run the document through a fax machine's inexpensive scanner mechanism. You can take advantage of the labor-saving features fax software provides: phone books that let you store the names and numbers of people you send faxes to frequently; deferred faxing features that let you postpone transmission until a later time (such as at night, when phone rates are lower); and fax-broadcasting features that let you send a fax to numerous locations in just one step.

Software for Communicating

Communications software falls into two basic categories — customized front-end programs such as those used by AppleLink and America Online (as well as CompuServe's Navigator and CompuServe Information Manager); and *terminal emulation* programs such as Hayes' Smartcom II, Software Venture's MicroPhone II, and The FreeSoft Company's White Knight. Many integrated programs, such as ClarisWorks and Microsoft Works, have basic communications features, too.

Front-end or terminal emulation software

Front-end programs are tailored to a specific service; you can't use America Online's software to access AppleLink any more than you can use your front door to enter your neighbor's house. Terminal-emulation programs, however, are general-purpose communicators: They can talk to just about any computer that answers. You can use terminal-emulation programs to access CompuServe, MCI Mail, Dow Jones, and GEnie in their native text modes and to tap into hobbyist bulletin boards. You can't use a terminal-emulation program to access a strictly graphical service such as America Online or AppleLink.

Both types of communications software are intermediaries between the Mac and the modem. When you start a communications session, the program transmits dialing commands to the modem; then waits for the modem to report when a connection is made and at what speed. After the connection is made, however, each type of program works differently. A front-end program performs much of its work behind the scenes, receiving instructions from the service telling it what icons and windows to display and sending commands to the service as you click icons and choose menu commands. A terminal-emulation program, in contrast, simply displays incoming text on the screen and transmits your typing to the other computer you're connected to.

Using script languages

Most terminal-emulation programs also provide features that streamline your on-line sessions. *Script languages* let you automate communications sessions by transmitting commands for you (see the Background box "Automating Communications"). A script may dial a service in the middle of the night (when phone rates and service activity are low), sign on, retrieve waiting mail, and then sign off. Less ambitious scripts may simply take you to a specific forum when you choose a menu command or type a keyboard shortcut. With careful scripting, you can create your own front end for text-oriented services.

Which program is for you?

Hayes' Smartcom II is my favorite terminal-emulation program. It's elegantly designed and easy to use, although it lacks some of the features found in MicroPhone II and White Knight. (The latter was formerly called Red Ryder and is the Mac world's shareware success story. Its fervent followers have inspired programmer Scott Watson to release updates at frequent intervals. Some people joke that you don't buy White Knight, you subscribe to it.)

If you plan to explore text-only services and bulletin boards extensively, you may be better served by MicroPhone II or White Knight.

Toward the On-line Age

When the first information service appeared, industry gurus began forecasting a day when people would do all their banking, learning, and shopping on-line. That day hasn't arrived — partly because the refinement and widespread acceptance of a technology always takes longer than its initial birth, but mostly because you can't endorse a check, go on a field trip, or try on clothes over the phone.

Still, communications is becoming a consumer commodity. Many banks offer bank-by-modem services, and the Internal Revenue Service even lets taxpayers file their returns by modem and get their refunds faster.

But to some people, the real consumer communications age won't arrive until telecommunications meets television. Imagine looking up the latest on-line news and seeing a television news report instead of a window full of text, or browsing an on-line encyclopedia and not only reading about Martin Luther King, Jr. but also seeing and hearing him give his most famous speeches. This kind of interactive

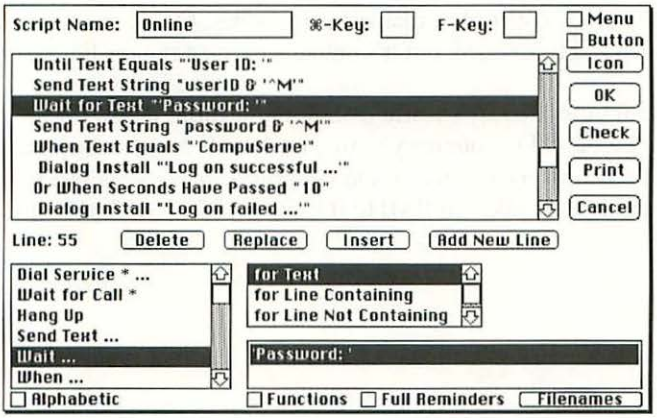
BACKGROUNDER

Automating Communications

Script languages let you automate communications sessions by transmitting commands to the service that you would otherwise have to type.The following figure shows portions of two scripts that sign on to CompuServe — the script as it appears in MicroPhone II (top), and in Smartcom II (bottom). Both scripts wait for certain incoming text (such as "Password:"), and then transmit text you specify as if you typed it.

Smartcom II's script language is easier to use but less powerful than those of MicroPhone II, White Knight, and Prometheus Products' MacKnowledge. The latter three programs also offer so-called learn modes: They can watch over your shoulder and record scripts based on your actions. You can use the resulting script as is or modify it by adding a delay or additional features. MicroPhone II and

(continued on the next page)



Script Name: Online
⌘-Key:
F-Key:

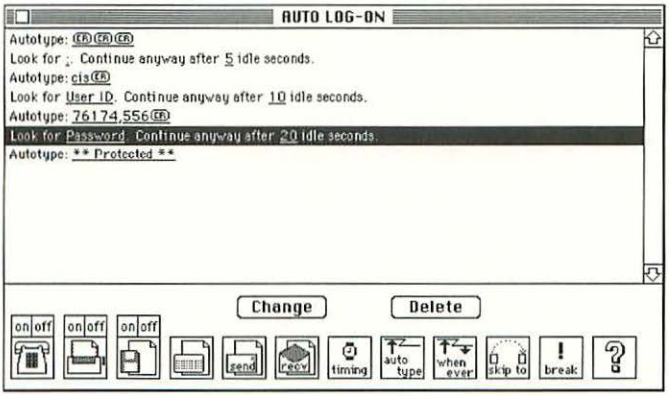
```
 Until Text Equals "'User ID: '"
 Send Text String "userID & '^M'"
 Wait for Text "'Password: '"
 Send Text String "password & '^M'"
 When Text Equals "'CompuServe'"
  Dialog Install "'Log on successful ...'"
 Or When Seconds Have Passed "10"
  Dialog Install "'Log on failed ...'"
```

Line: 55

```
Dial Service * ...
Wait for Call *
Hang Up
Send Text ...
Wait ...
When ...
```

```
for Text
for Line Containing
for Line Not Containing
```

'Password: '



AUTO LOG-ON

```
Autotype: (CR)(CR)(CR)
Look for :. Continue anyway after 5 idle seconds.
Autotype: cis(CR)
Look for User ID. Continue anyway after 10 idle seconds.
Autotype: 76174,556(CR)
Look for Password. Continue anyway after 20 idle seconds.
Autotype: ** Protected **
```

(continued from the previous page)

MacKnowledge also provide features that let you execute scripts one step at a time — useful when a script isn't behaving as you expected.

The script languages in MicroPhone II, White Knight, and MacKnowledge also let you create custom pull-down menu commands and icons that, when chosen, execute scripts. You can use these features to create your own customized front end for a text-oriented service such as CompuServe. Prometheus's MacKnowledge software does just that for not only CompuServe, but also for Dow Jones/News Retrieval, MCI Mail, GEnie, and other services.

Creating graphical front-end software isn't a trivial task. For one thing, you need familiarity with basic Mac programming concepts such as creating and responding to choices in pull-down menus and dialog boxes. What's more, you need to anticipate every event that might occur during a session — from data-garbling static to busy signals. If you don't, your scripts will operate unreliably.

news and video exists today, thanks to videodiscs, QuickTime, and authoring programs such as HyperCard, but it's unlikely to meet the on-line world for some time.

This doesn't mean today's world of communications doesn't have a great deal to offer. It does, and I encourage you to sample it. If you do, drop me an e-mail note and let me know how you use it. On CompuServe, I'm 76174,556; on America Online and AppleLink, I'm JIMHEID; and on MCI Mail, JHEID.

CHAPTER 17 CONCEPTS AND TERMS

- You can telecommunicate on two basic levels — directly with another computer, or through an intermediary such as an information service or bulletin board.
- Most on-line services provide electronic mail (exchanging messages and disk files with other subscribers); research (consumer articles and demographic reports, for example); travel (travel news and information and on-line flight-reservation systems); shopping (on-line malls); and special-interest forums (communicating with other subscribers on a wide range of issues).
- Choosing an information service involves assessing your budget and information needs and then deciding how important a Mac-like interface is to you.
- A modem is the computer's link to the on-line world. It converts, or modulates, the data coming from the Mac into audio tones that phone lines can carry, and demodulates the incoming tones into data the Mac can understand.

bulletin board
A small-scale on-line service operated by computer hobbyists that acts as an electronic meeting place for user group members.

download
To receive a file from an on-line service or bulletin board.

electronic mail
Correspondence exchanged via on-line services.

file-transfer protocol
A method of transferring a disk file which causes data to be "proofread" to eliminate garbled data.

front end
A program that presents a Mac-like interface for a text-oriented on-line service such as CompuServe.

gateway
A link provided by one on-line service that lets you access or exchange mail with users of another on-line service. For example, CompuServe provides a gateway that lets you exchange mail with MCI Mail subscribers.

modem
The hardware that connects a Mac to the telephone line. The word modem is a short form of the words modulate and demodulate. Direct-connect modems attach between a phone jack and the Mac's modem or printer port, and have a jack into which you can plug a telephone. Acoustic modems contain cups into which you snug a telephone handset. Fax modems let you send, and often receive, faxes.

on-line service
A commercial communications service that charges hourly or monthly rates for access to news, shopping services, special-interest forums, and vast libraries of free and nearly free software.

script language
A command language that lets you automate communications sessions by transmitting commands for you in response to prompts from an on-line service. Most terminal emulation programs provide script languages.

shareware
A program that you can try at no cost but are expected to pay a modest fee for if you decide to keep it.

terminal emulation software
A program, such as Hayes Smartcom II or Software Ventures' MicroPhone II, that turns a modem-equipped Mac into a terminal that can access an on-line service.

upload
To transfer a file to an on-line service or bulletin board.

CHAPTER EIGHTEEN

Downloading Freeware and Shareware

IN THIS CHAPTER

- Getting software for less in the world of freeware and shareware
- Paying for shareware — got any Grateful Dead tapes?
- Downloading software from CompuServe and America Online
- Understanding and choosing file-transfer protocols
- Decompressing software after a download

Your Mac is but a phone call away from a library of free and inexpensive software. All you need to tap into the world of *freeware* and *shareware* are a telephone modem and a communications software package. Then you can dial out to hobbyist bulletin board systems or better still, subscribe to an on-line service such as CompuServe or America Online.

What kind of software is out there? You name it. There are utilities that check your system for viruses and others that compress files to save disk space. There are fonts, programs that modify fonts, and programs that print font samples. There are programs that display a digital clock in your menu bar, that synchronize your Mac's clock with the government's atomic clock, and that let your Mac speak the time when you press a key.

Have a PowerBook? You'll find utilities that make it easier to locate the pointer on a dim screen, that automatically dim the display after a few minutes to save battery power, and that let you put the hard disk to sleep with a single keystroke.

ON THE CD

- 30MB of great freeware and shareware from the legendary Berkeley Macintosh Users Group (BMUG)
- Shareware or free software from Jim Lewis, Software Perspectives, and France and Associates

Want fun? How about a program that lets the Mac play different sounds when you insert or eject disks, empty the Trash, and perform other activities? And there are sounds themselves: You can find clips from *Star Trek*, *Terminator II*, *Twin Peaks*, *Ren and Stimpy*, *The Simpsons*, George Bush, and other cartoon characters. You can find more sounds than you have disk space for. That goes double for QuickTime movies.

There's also plenty for the serious-minded; for example, a full-featured spreadsheet program as well as spreadsheet templates for loan amortization, investment analysis, and more. HyperCard buffs can find stacks galore, from one that tracks your videotape collection to a mixology stack containing (hic!) 137 drink recipes (see Chapter 20 for more details on HyperCard).

Sharing a sense of community

The shareware system illustrates the generosity and sense of community you find on-line. You can download a shareware program from an on-line service and try it out for a week or two. If you find it useful, send a check to the author. In return, you often get a printed manual (most shareware programs come with on-screen documentation) and a disk containing the latest version of the program. Payment usually ranges from $5 to $50, although some programmers prefer other forms of remuneration. One programmer asks for a postcard from your home town, another requests a donation to UNICEF, another wants $25 or a case of beer, and one requests Grateful Dead concert tapes.

Freeware doesn't cost a cent (aside from the cost of the phone call and the on-line service's connect-time charge — two tariffs that almost always apply when you're on-line). But don't get the idea that a free program isn't worth anything. The best virus-detection utility is free, as is a popular utility for managing System 7 extensions (those files that load into memory during startup, displaying their icons along the bottom of the screen). Freeware programmers are often inspired by fellow subscribers: On Friday, someone may ask if a certain kind of program is available; by Monday, it often will be.

Clearing some download hurdles

Downloading software from an information service is fairly easy, although there are a few technical hurdles that can trip up communications newcomers. In this chapter I describe the key technicalities behind downloading and show you how to download from two services — CompuServe and America Online. If you don't have a modem, see the previous chapter for details on what to look for.

About the Services

CompuServe is the largest on-line service. You can access CompuServe using general-purpose communications programs such as Hayes' Smartcom II, Software Ventures' MicroPhone II, and The FreeSoft Company's White Knight. As I mentioned in the previous chapter, I'm partial to Smartcom II; it's straightforward and powerful. Real communications fiends may prefer MicroPhone II or the legendary White Knight, which has a funky, folksy look and feel that gives away the program's shareware origins. (As you saw in the previous chapter, both programs provide more communications features and more sophisticated scripting languages than other communications programs, which let you automate communications.)

CompuServe's old-style efficiency

Seen through any of these programs, CompuServe looks like a relic from a user-interface museum. Instead of using pull-down menus, icons, and the like, you type commands in response to text menus. It isn't easy, but it is efficient: You can navigate the system quickly once you get the hang of its menus.

An easier way to access CompuServe involves using CompuServe's own *CompuServe Information Manager* (CIM), a program that puts an icon-based graphical user interface (GUI) between you and CompuServe's mainframe computers. When you click CIM's icons and choose commands from its menus, the program transmits the text commands CompuServe expects.

America Online's slick graphic look

CIM's friendly facade works reasonably well, but it isn't as smooth and polished as America Online. This relative newcomer to the on-line scene relies on its own, strictly graphical communications software, which you can receive free by calling 800-827-6364, extension 5547. America Online lacks many of the specialized services available on CompuServe, but by and large, it's just as good a source for software. Good software travels quickly in the on-line world; a hot program that debuts on one service is usually quickly uploaded to other services.

A slew of other services

Both CompuServe and America Online offer many services apart from their software libraries — wire service news, electronic mail, research encyclopedias, and hobby forums for everything from tropical fish to ham radio. I'll leave you to explore these aspects of on-line life; after all, we're here to scarf up software.

First Steps

Getting set up to download software involves several steps. First, you need to configure your communications software to talk to the remote system on its terms. That means specifying a phone number to dial (the starter kits for commercial services include a list of them) as well as various communications settings, including the data-transmission rate, often called the *baud rate* or *bit rate* (usually 1200 or 2400 bits per second, or bps). Generally, you'll do this just once, before you sign on for the first time.

Making a connection

Both Smartcom II and MicroPhone II include canned, properly configured settings files for CompuServe, as well as a variety of scripts that automate access to CompuServe. (An automatic log-on script, for example, dials the modem and supplies your ID number and password.) If your telecommunications program doesn't have these canned settings files, configure your communications settings to 7 data bits, 1 stop bit, even parity, and the fastest speed your modem supports (usually 1200 or 2400 bps). These basic settings ensure that your modem and CompuServe's will be able to connect.

Signing on

The CompuServe introductory membership brochure that accompanies most communications programs includes a temporary ID number and password you can use to sign on for the first time. The America Online software automates the sign-on process: Simply start the program and follow the on-screen directions. (Have a credit card handy: You'll need it to supply billing information.) CompuServe Information Manager includes a program called Signup that works similarly.

Choosing a Transfer Protocol

Accuracy is paramount when downloading software, because even one missing or garbled bit can render a downloaded program useless. If you're using a general-purpose communications program to access CompuServe, you need to perform another step before you can begin downloading — choosing a *file transfer protocol.* That's a three-dollar phrase, but it simply refers to a set of rules that both computers use to ensure that a file is transferred accurately.

With a file-transfer protocol, the sending computer (in this example, CompuServe's mainframes) sends the file in chunks called *blocks.* When your Mac receives a block, it compares notes with CompuServe to make sure it received the block accurately. If it didn't, it requests the block again. If it did, it gives the go-ahead to send the next block. This Did-you-get-it? Yes-I-did banter continues until the entire file has been transferred. (For more background on transfer protocols, see the Background box "More About Transfer Protocols.")

In the end, the underlying details behind these protocols aren't important. What is important is that you set up your program to use a transfer protocol that the sending computer also supports. I recommend starting out with XMODEM. As you become an experienced downloader, you may want to experiment with other protocols to see if they reduce downloading times, and if so, by how much.

For instructions on choosing the XMODEM transfer protocol in Smartcom II, White Knight, and MicroPhone II, see the Step-by-Step box "Make Mine XMODEM."

BACKGROUNDER

More About Transfer Protocols

Several file-transfer protocols exist — XMODEM, YMODEM, ZMODEM, Kermit, CompuServe A, CompuServe B, and MacTerminal. There are even variants within each type of protocol — XMODEM-CRC, XMODEM-1K, CompuServe B Plus. All text-oriented services such as CompuServe support XMODEM. Microphone II, Smartcom II, and White Knight all support XMODEM, YMODEM, ZMODEM, and their variants as well as Kermit. MicroPhone II and Smartcom II also support the CompuServe B Plus protocol.

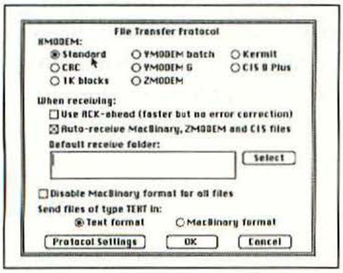
Each file-transfer protocol and variation thereof uses different block sizes, different error-checking techniques, or both. For example, the original XMODEM uses a 128-byte block size, while XMODEM-1K uses 1024-byte blocks. This larger block size means the on-line service spends less time asking your Mac if things are okay, and more time transmitting the file. The down side: If the phone lines are noisy, the transmitting computer has to spend more time resending blocks. Small block sizes are best for noisy connections, while large block sizes are best for clean connections. (This is an area where ZMODEM shines — block sizes are adjusted for conditions, and if you lose the connection, you can pick up where you left off.) If you choose a protocol that uses a large block size (such as XMODEM-1K) and you find you're getting a lot of *retries* — retransmitted blocks — during a download, chances are you have a noisy connection and could benefit from choosing a protocol that uses a smaller block size (such as plain XMODEM).

If you use CIM or America Online, you don't have to fuss with choosing a transfer protocol. CIM automatically uses the CompuServe B Plus protocol, and America Online uses its own transfer protocol.

STEP-BY-STEP

Make Mine XMODEM

The instructions in this box show how to select the XMODEM MacBinary protocol in Smartcom II, White Knight, and MicroPhone II.



File Transfer Protocol

XMODEM:

● Standard ○ YMODEM batch ○ Kermit
○ CRC ○ YMODEM G ○ CIS B Plus
○ 1K blocks ○ ZMODEM

When receiving:

☐ Use ACK-ahead (faster but no error correction)
☒ Auto-receive MacBinary, ZMODEM and CIS files

Default receive folder:

☐ Disable MacBinary format for all files

Send files of type TEXT in:

● Text format ○ MacBinary format

To choose the XMODEM protocol in Smartcom II:

1. **Choose File Transfer Protocol from the Settings menu.** The File Transfer Protocol dialog box appears.
2. **Select the XMODEM Standard button and be sure the Auto-receive MacBinary option is checked.**
3. **If you want downloaded files to be stored in a specific folder, click the Select button and then choose the folder.**

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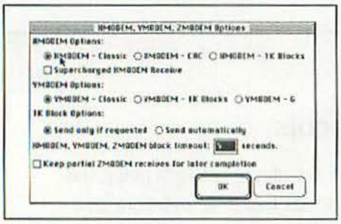


XMODEM, YMODEM, ZMODEM Options

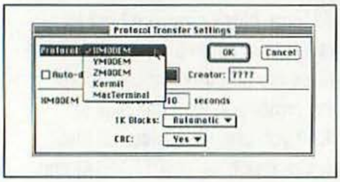
XMODEM Options:
● XMODEM - Classic ○ XMODEM - CRC ○ XMODEM - 1K Blocks
☐ Supercharged XMODEM Receive
YMODEM Options:
● YMODEM - Classic ○ YMODEM - 1K Blocks ○ YMODEM - G
1K Block Options:
● Send only if requested ○ Send automatically
XMODEM, YMODEM, ZMODEM block timeout: seconds.
☐ Keep partial ZMODEM receives for later completion

To choose the XMODEM protocol in White Knight:

1. **From the Options submenu of the Customize menu, choose X-Y-ZMODEM.**

   The XMODEM, YMODEM, ZMODEM Options dialog box appears.

2. **Select the XMODEM — Classic option.**
3. **Click OK or press Return.**



Protocol Transfer Settings

Protocol: ✓XMODEM
☐ Auto-d
Creator: ????
XMODEM
10 seconds
1K Blocks: Automatic
CRC: Yes

To choose the XMODEM protocol in MicroPhone II:

1. **Choose Protocol Transfer from the Settings menu.**

   The Protocol Transfer Settings dialog box appears.

2. **From the Protocol pop-up menu, choose XMODEM.**
3. **Click OK or press Return.**

Downloading From CompuServe

One way to locate files available for downloading is to enter a specific forum (games, utilities, sounds, fonts, and so on) and then look around. Let's say you want to see what's been added to the arcade and action games section of the games forum within the last week.

From any CompuServe menu, type **go macfun** and press Return. (If you use CIM, choose Go from the Services menu and then type **macfun.**)When the forum menu appears, type **3** and press Return to enter the file libraries. When the menu of libraries appears, type **2** and press Return to enter the Arcade/Action Games library. Finally, type **cat/des/age:7** and press Return. This displays a catalog (cat) and description (des) of files added within the past seven days (age:7).

Searching with keywords

You can also add a keyword to narrow your search; for example, **cat/des/age:7/key:poker** narrows the search to up-to-week-old poker games. Keywords let you search according to descriptive words assigned to the file when it was originally uploaded. Omit the *age* portion of the command to search all files regardless of when they were uploaded.

Using the file finder

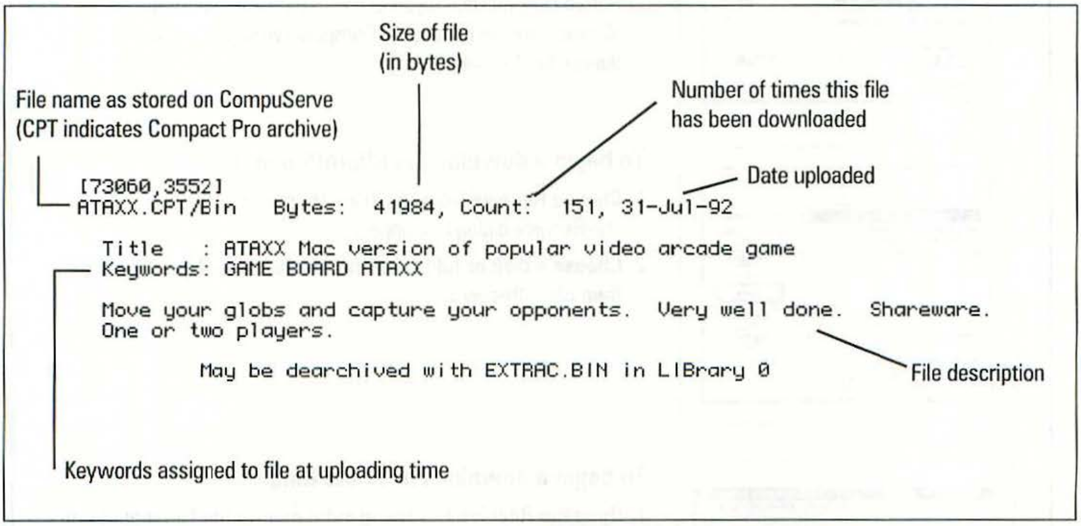
CompuServe also provides a file finder feature that lets you automatically search all Mac forums at once instead of having to enter a specific forum and then look around. This is handy if you're not sure where a certain type of file may be.

To access CompuServe's file finder, type **go macff** (Return) at any CompuServe menu. The file finder lets you search by numerous criteria — submission date, forum name, and so on — but you'll probably find the keyword option the most useful.

The main drawback of CompuServe's file finder is that you can't directly download a file when it's found; instead, you need to jot down its name and location, and then move to that forum to download it using the techniques just described. This drawback doesn't apply if you're using CompuServe Information Manager.

Deciphering file descriptions

CompuServe's file descriptions include a variety of information (see Figure 18-1 "Deciphering Descriptions"), but the most important information is the filename as it's stored on CompuServe's computers. When you find a file you want to download, you type that name.



```
[73060,3552]
ATAXX.CPT/Bin   Bytes:  41984, Count:  151, 31-Jul-92

  Title   : ATAXX Mac version of popular video arcade game
  Keywords: GAME BOARD ATAXX

  Move your globs and capture your opponents.  Very well done.  Shareware.
  One or two players.

          May be dearchived with EXTRAC.BIN in LIBrary 0
```

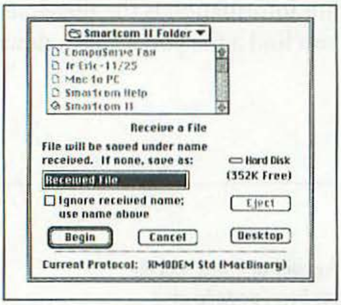
Size of file (in bytes)
File name as stored on CompuServe (CPT indicates Compact Pro archive)
Number of times this file has been downloaded
Date uploaded
File description
Keywords assigned to file at uploading time

Figure 18-1: Deciphering Descriptions A typical CompuServe file description resembles the one shown here.

Say you want to download the file profiled in Figure 18-1. At CompuServe's Enter choice! prompt, type **dow ataxx.cpt** and press Return. CompuServe responds with a menu of available file-transfer protocols. Type **1** and then press Return to choose the XMODEM protocol, and then tell your program to begin receiving as described in the Step-by-Step box "Beginning a Download."

Beginning a Download

The instructions in this box show how to begin downloading a file from CompuServe using Smartcom II, MicroPhone II, and White Knight. The steps here assume that you've already told CompuServe that you want to download a file and that you've chosen a file-transfer protocol. If you haven't performed these steps, read the last paragraph in the previous section for an overview of the process.



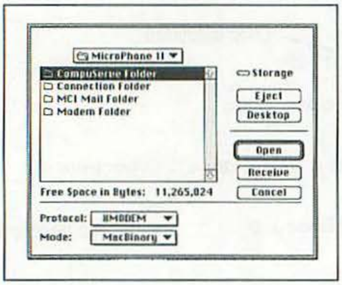
File will be saved under name received. If none, save as: Received File

☐ Ignore received name: use name above

Current Protocol: XMODEM Std (MacBinary)

To begin a download in Smartcom II:

1. **Click the Recv icon.**
   The Receive a File dialog box appears.
2. **Choose a disk or folder for the received file if you like, and then click Begin or press Return.**
   Before clicking Begin, you can also type a name for the file, although you don't have to; CompuServe supplies the name during the download.



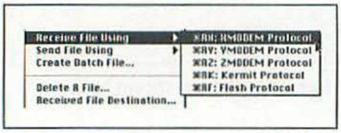
Free Space in Bytes: 11,265,024

Protocol: XMODEM

Mode: MacBinary

To begin a download in MicroPhone II:

1. **Choose Receive from the Transfer menu.**
   The Receive dialog box appears.
2. **Choose a disk or folder for the received file if you like, and then click Receive.**



To begin a download in White Knight:

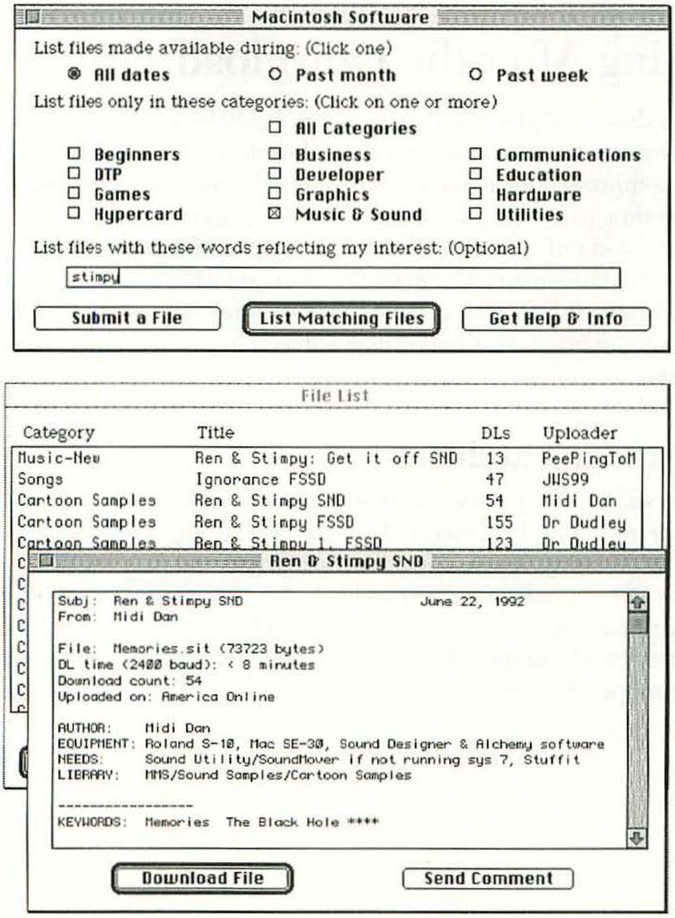
1. **Open the Receive File Using submenu (in the File menu) and choose XMODEM Protocol.**
   To specify where a file will be stored, use the File menu's Received File Destination command before starting the download.

Downloading from America Online

As you can see, accessing CompuServe using a general-purpose communications program means typing your way through a maze of text menus. CIM streamlines the process, but it's still clunky compared to America Online.

Browsing the software library

As with CompuServe, you can locate files on America Online by visiting each forum or by using a file-search feature. To jump directly to the software libraries, choose Keyword from the Go To menu, and then type **software** and click OK. This displays the Software Libraries window, whose first entry is File Search. Double-click File Search, and the file finder window appears (see Figure 18-2 "Finding Online").



List files made available during: (Click one)

● All dates ○ Past month ○ Past week

List files only in these categories: (Click on one or more)

☐ All Categories

☐ Beginners ☐ Business ☐ Communications
☐ DTP ☐ Developer ☐ Education
☐ Games ☐ Graphics ☐ Hardware
☐ Hypercard ☒ Music & Sound ☐ Utilities

List files with these words reflecting my interest: (Optional)

stimpy

Category	Title	DLs	Uploader
Music-New	Ren & Stimpy: Get it off SND	13	PeePingTom
Songs	Ignorance FSSD	47	JWS99
Cartoon Samples	Ren & Stimpy SND	54	Midi Dan
Cartoon Samples	Ren & Stimpy FSSD	155	Dr Dudley
Cartoon Samples	Ren & Stimpy 1. FSSD	123	Dr Dudley

```
Subj:  Ren & Stimpy SND                              June 22, 1992
From:  Midi Dan

File:  Memories.sit (73723 bytes)
DL time (2400 baud): < 8 minutes
Download count: 54
Uploaded on: America Online

AUTHOR:     Midi Dan
EQUIPMENT:  Roland S-10, Mac SE-30, Sound Designer & Alchemy software
NEEDS:      Sound Utility/SoundMover if not running sys 7, Stuffit
LIBRARY:    MMS/Sound Samples/Cartoon Samples

-----------------
KEYWORDS:   Memories  The Black Hole ****
```

Figure 18-2: Finding Online America Online's file finder makes locating files easy. If you're on the prowl (top) for digitized Ren & Stimpy sounds, note the keyword. The File List window in the background (bottom), lists files located by the file finder. Double-clicking an entry opens another window containing a description of the file and a button for downloading it.

Fast access to top programs

America Online also offers fast access to the most popular downloads. In the Software Libraries window, double-click the Macintosh — Top Downloads entry to display a window of the current month's most popular downloads. If a given file sounds interesting, double-click its entry to display a description window (see Figure 18-2 "Finding Online"). To download the file, click the description window's Download File button and then specify a location for the file. America Online lets you know how much time downloading will take, and when it's done, a digitized voice announces, "File's done."

Deferring your download

America Online also lets you mark a group of files for deferred downloading. Instead of having to download files one at a time, simply select all the files you want, and America Online downloads them all in one fell swoop.

Decompressing After the Download

After you've downloaded a program, you'll probably be anxious to try it out. But there's still one more task to perform. Files downloaded from an on-line service are stored in a compressed form that takes up less disk space and, more important, requires less time to upload and download. The person who uploaded the file used a file-compression utility such as Aladdin Systems' StuffIt series, Salient's DiskDoubler, or Bill Goodman's Compact Pro to create what's often called an *archive* — a single disk file that contains one or more compressed files. Before you can try out the programs you've downloaded, you must decompress them to their original form.

Self-extracting archives

The compression utilities I just mentioned have the ability to create *self-extracting archives* — archive files that you can decompress without having to own a copy of the compression utility. These days, many programs and files available on information services arrive as self-extracting archives. You can recognize such a file by looking at its name; self-extracting archives usually have the characters *sea* tacked onto their names. Decompressing a self-extracting archive is easy: Double-click its icon and then specify where you want the decompressed file or files to be stored.

Unstuffing it yourself

If the file's name ends with other characters, it probably isn't a self-extracting archive, and you'll need a copy of the compression utility to open and decompress the archive. Archives whose names end in *sit* were created using StuffIt: Most files available on-line are either self-extracting archives or StuffIt archives.

You can decompress StuffIt files using the shareware StuffIt Lite, which is available on-line as a self-extracting archive. If you don't want to pay the shareware fee, you can download StuffIt Expander, a free, stripped-down StuffIt that can decompress files, but not compress them. A free, decompress-only version of Compact Pro is also available on-line. StuffIt Expander can also decompress Compact Pro and AppleLink archives.

America Online also streamlines the decompression process. It contains software that can automatically decompress StuffIt-format archives as soon as you sign off.

Other Downloading Opportunities

I've concentrated on freeware and shareware forums here, but there are other on-line sources for software, too. Many top software developers have customer-support forums on CompuServe and America Online, and have their own software libraries that contain demonstration versions of their programs, sample documents, answers to commonly asked questions, and more.

Hardware companies often post the latest versions of the system extensions their products require. The extensions are free except for the connect-time charges.

Then there are bulletin boards, small-scale on-line services often run by user groups or communications fiends. A HyperCard stack called The Mac BBS Stack (available on-line) contains a partial list of bulletin board systems. A list of bulletin boards also accompanies White Knight and the *Macworld Complete Mac CD* (in the Best of BMUG collection).

The technicalities behind downloading can seem complicated at first, especially if you use text-oriented services like CompuServe. Just remember: Be sure your communication settings and transfer protocols match those of the service, decompress your files after downloading them, and don't forget to pay for shareware that you use — even if you aren't a Grateful Dead fan.

CHAPTER 18 CONCEPTS AND TERMS

- On-line services and bulletin board systems are bursting with megabytes of free or nearly free software as well as digitized sounds, scanned images, QuickTime movies, and technical support advice.
- Shareware is software that you can use at no cost for a limited amount of time; if you like a program, you send the author a small fee, which often entitles you to a printed manual and an update to the latest version.
- To ensure that software is transferred with no garbled bits, you use a file-transfer protocol when downloading files.
- Numerous file-transfer protocols exist. XMODEM MacBinary is the most common, but is being rapidly supplanted by ZMODEM.
- CompuServe, America Online, and other on-line services provide searching features that let you locate downloadable files based on keywords, dates, categories, and other criteria.
- Files are usually stored by an on-line service in a compressed form that requires less time to download. After you download a file, you have to decompress it using a program such as StuffIt or Compact Pro.

blocks
The chunks in which a file is transferred under a file-transfer protocol such as XMODEM. The transmitting computer sends a block, compares notes with the receiving computer, and then either transmits the next block or resends the block until it's received accurately.

freeware
A program that's distributed free of charge. Freeware programs are often called *public-domain programs,* but the latter term is usually inaccurate: The freeware programmer still retains copyrights to the program, but he or she simply permits the program to be copied freely.

shareware
A program that's distributed on a try-before-you-buy basis: Try the program for a week or two and if you decide to keep it, pay the author a requested fee.

CHAPTER NINETEEN

Optical Character Recognition

IN THIS CHAPTER

- Bridging the gap between the Mac and the printed page with OCR
- Exploring the six phases of an OCR job and the challenges each presents
- Shopping for the best OCR program
- Scanning — the hardware half of the OCR equation
- Getting the most accurate results

Every so often, you're reminded that the Mac is incompatible with the most widely used data-storage medium in the world — paper. This revelation may dawn when you have to laboriously retype a financial table from last year's annual report, or when you spend hours pawing through magazines to locate something you read a few months ago. Wouldn't it be wonderful if you could apply the Mac's sorting, searching, and storing skills to the printed material that touches your life every day?

I have some good news and some bad news. The good news is that you can bridge the gap between the Mac and the printed page, thanks to *optical character recognition*, or OCR, software. When teamed with a scanner, OCR software lets a Mac read, or *recognize*, printed pages and create files containing their text. You can edit the resulting text, reformat it, run it through spelling checkers, save it, or paste it into databases or HyperCard stacks for quick searching. Pop a page into your scanner, click a button, and voilà — instant text, ready to be sliced and diced as you see fit.

The bad news is that it isn't as rosy as all that. Some OCR programs read certain kinds of text better than others, and to get the fastest, most accurate results, you need to match the program to the OCR task at hand. What's more, OCR software craves memory and processing power. Some low-end OCR programs run (albeit slowly) on Mac Pluses, Classics, and SEs, but extensive OCR work demands a faster Mac.

Finally, OCR isn't a magic potion that automatically saves time and keystrokes. The best results come from practice and experience, and still require careful proofreading. If you're compiling a digital library of text scanned from publications, you must develop an electronic filing system that lets you find what you've scanned. You also need a hard disk that can hold it all, and a backup regimen to keep it safe. In this chapter, I describe how OCR programs work, and spotlight some of the features you can find in them.

Who Needs to Read?

OCR isn't a panacea, but that doesn't mean it isn't useful. Here's a sampling of OCR applications.

Printers and typesetters

A printing service bureau or typesetting company uses OCR for clients who submit copy on paper rather than on disk. Of course, proofreading is still essential — no matter how you use OCR — but not having to retype all that text can save a lot of time, thereby cutting typesetting costs.

Lawyers

A law firm scans legal briefings and contracts that were produced before the office became computerized. Having those old documents on disk enables the firm to reuse sections of them as needed, and it allows for fast searching of client histories.

Brokers

A stock brokerage scans company prospectuses and pastes the numeric data into Microsoft Excel to generate graphs that show companies' financial status. The text from the prospectuses and from annual reports is pasted into a HyperCard stack that brokers can use to advise their clients.

Office librarians

An office that used to distribute weekly photocopies of newspaper and trade-magazine clippings now scans them and stores the resulting text files on a network file server, where they are available to everyone. Employees can quickly search the electronic clippings and copy key sections for inclusion in reports or for distribution to others. The information is more accessible, and the office saves filing space as well as paper and photocopying costs. And cutting paper use benefits the environment as much as it does the bottom line.

Personnel specialists

A corporation's human resources department receives hundreds of resumes each day. They're scanned, and the resulting text is imported into a database manager, which sorts them into job categories, and then creates a text file for each category. The resulting files are forwarded via electronic mail to appropriate personnel managers in offices across the country. No photocopying, no express courier charges, just increased efficiency.

Common denominators

These scenarios share a common thread — OCR used department-wide or company-wide, not at individual desks. That isn't to say individuals can't benefit from OCR; they can, if they have enough text to scan or their typing is bad enough. But given its cost and the time required to use it, OCR makes the most sense when a group of people can share its benefits — as they do with the office photocopier.

These scenarios also involve a variety of hard-copy originals, from manuscripts and contracts to resumes and magazine pages. Manuscripts and contracts aren't too tricky; they are often produced in a simple typewriter font such as Courier.

Magazine and newspaper pages are another matter. They can use just about any font and any format, from justified left and right margins to irregularly shaped columns that wrap around a photograph or illustration. And resumes may be the ultimate formatting wild card. You never know what fonts you'll find, and you may receive a photocopy rather than an original. It's this variety of hard copy that makes it important to match the OCR program to the scanning task at hand.

Six Steps to OCR

A typical OCR job has six phases. Each phase impacts the accuracy of the final product and also imposes its own demands on a scanner, an OCR program, and your skill as an OCR operator. What follows is an overview of the process along with comments on how some of today's top OCR packages — Xerox's AccuText, Caere's OmniPage Professional and OmniPage Direct, and ExperVision's TypeReader — handles each phase. The Quick Tips box "Choosing OCR Software" summarizes the key issues to consider when shopping.

Setting up for the scan

At this stage, you specify details such as the scanning resolution (generally always 300 dots per inch) and brightness. The OmniPage series and TypeReader also let you choose to retain or discard formatting such as italic or bold type. Some programs can also scan and separately save the graphics in an original — handy if you're updating an old technical manual containing schematics and diagrams.

Scanning the original

An OCR program can't deliver accurate results without a high-quality image. Accuracy plummets if the scan is crooked or if poor brightness adjustments create a muddy or washed-out image. An overly-dark image causes problems because char-

QUICK TIPS

Choosing OCR Software

Here's a checklist of features to look for when you go shopping for OCR software:

- *Direct support* for your scanner lets you scan pages and recognize text using just one program. If an OCR program can not directly control your scanner, you need to scan pages using the software that accompanies the scanner, and then save them in a format the OCR program can read — a time-consuming approach.
- A *built-in editor* lets you review and alter the resulting text without switching to a word processor. Search-and-replace commands are useful for correcting problems that occur throughout, such as when a *w* is read as *vv*.
- *Format recognition* retains formatting attributes such as boldface, underlining, italics, centering, and justification. Some programs can also distinguish between multiple columns, enabling you to read them as a single table or as snaking (magazine-style) columns.
- *Support for multiple file formats* increases the odds that you'll be able to move recognized text into another application while retaining its formatting. Some programs can save documents in text-only format; others support popular word processing and spreadsheet formats.
- A *spelling checker* helps with (but doesn't eliminate) proofreading. Some OCR programs provide spelling checkers that are tuned to look for substitution and other typical OCR-oriented errors.
- *Graphics recognition* lets you save the graphics that appear in an original document. This can be useful if, for example, you're producing a new version of a printed manual containing illustrations.
- *Background operation* under System 7 or System 6 MultiFinder lets the OCR program decipher a page while you work in another application. Some programs also offer a *batch mode* that lets you scan a stack of pages, but defer the actual recognition process until a later time.
- *Landscape support* lets you scan documents printed in landscape orientation (for example, 11 by 8½ instead of 8½ by 11).

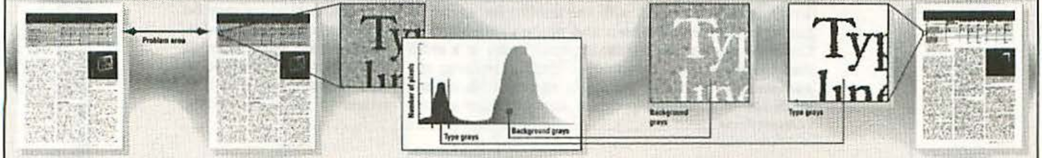
acters tend to touch and the hollow portions of round characters (such as *e*) tend to fill in. A washed-out image complicates recognition because fine character details are lost. For example, if the top and bottom of an *O* are lost, a program may misread the character as two parentheses ().

A relatively recent development addresses the need for a high-quality image. Hewlett-Packard's AccuPage technology, supported by scanners from HP and other firms, automatically adjusts brightness during the scan for optimum results (see Figure 19-1 "Bringing Type Out of the Background").

BRINGING TYPE OUT OF THE BACKGROUND

How does an OCR program recognize hard-to-distinguish type that has been printed against a shaded background? Both Hewlett-Packard's AccuPage and Caere's AnyPage technologies attempt to solve this problem by analyzing a gray-scale scan of the page and intelligently converting it into a black-and-white bitmap that shows only black type against a white background, providing the sharp edges and clear images necessary for accurate recognition.

Original color page **Gray-scale scan** **Analysis** **Adjustment** **Final bitmap**



The page is scanned using a grayscale scanner. The shaded area at the top of the page is the problem area. If the scanner has been adjusted for the best possible scan of the overall page, the shaded area comes out too dark, obscuring the text.

Both AccuPage and AnyPage divide the scan into small regions and use a variety of image processing techniques to identify the text. One technique, shown here, counts the number of pixels that fall in each of the 256 levels of grays captured by the scan.

In the ideal case, shown here, there are two distinct groupings of gray levels: a clump in the darker grays that represent type, and a larger amount of lighter grays that represent the shaded background. In practice, more-complex analysis must often be done to correctly identify the grays that make up the type and the background.

Once the grays that represent the background are identified, they are converted to white, while the grays that represent type are identified and converted to black.

The resulting black-and-white scan of the page is passed to the part of the supporting OCR program that recognizes shapes as letters.

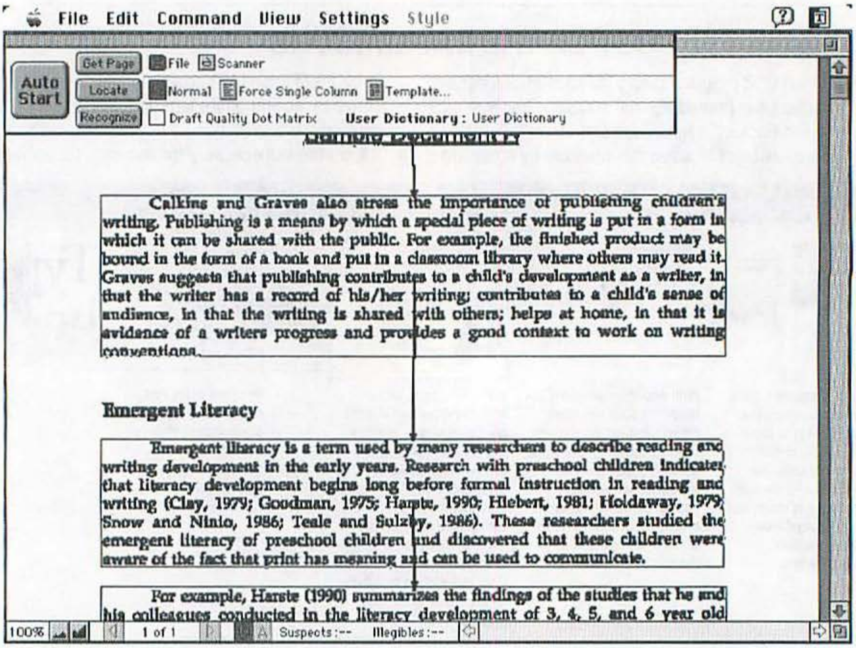
Figure 19-1: Bringing Type Out of the Background

Most programs support the *automatic document feeder* (ADF) attachments that are available for many flatbed scanners (but not for Apple's). AccuText, OmniPage Pro, and TypeReader even enable you to scan double-sided originals: First run the odd-numbered pages through the ADF and then scan the even-numbered ones, and these programs automatically put the pages in their correct order.

Selecting text to be recognized

If you're scanning a complex multicolumn page, you need to tell the OCR program which columns you want to recognize and in what order. All programs provide a marquee tool that enables you to select the areas, or *zones*, you want to recognize (see Figure 19-2 "Zoning in Progress").

Instead of manually selecting zones, you may prefer to rely on a program's automatic zoning or *page decomposition* feature, where the program looks for areas of horizontal and vertical white space to differentiate columns and text blocks. But problems can arise. The sidebars and captions in a magazine or newspaper page can wind up interspersed with the main text. Or, a program may try to recognize the text in a letterhead when all you want is the letter's contents. Or it may try to treat the columns in a table as newspaper-style snaking columns, recognizing each column separately from top to bottom instead of reading across each row.



Calkins and Graves also stress the importance of publishing children's writing. Publishing is a means by which a special piece of writing is put in a form in which it can be shared with the public. For example, the finished product may be bound in the form of a book and put in a classroom library where others may read it. Graves suggests that publishing contributes to a child's development as a writer, in that the writer has a record of his/her writing; contributes to a child's sense of audience, in that the writing is shared with others; helps at home, in that it is evidence of a writers progress and provides a good context to work on writing conventions.

Emergent Literacy

Emergent literacy is a term used by many researchers to describe reading and writing development in the early years. Research with preschool children indicates that literacy development begins long before formal instruction in reading and writing (Clay, 1979; Goodman, 1975; Harste, 1990; Hiebert, 1981; Holdaway, 1979; Snow and Ninio, 1986; Teale and Sulzby, 1986). These researchers studied the emergent literacy of preschool children and discovered that these children were aware of the fact that print has meaning and can be used to communicate.

For example, Harste (1990) summarizes the findings of the studies that he and his colleagues conducted in the literacy development of 3, 4, 5, and 6 year old

Figure 19-2: Zoning in Progress Most programs let you specify which zones you want to recognize and in what order. Here, three zones have been defined and linked in AccuText. If you used automatic zoning for this page, the figure captions in the middle column would end up in the middle of the text.

To work around these problems, most programs let you indicate which zones you want to recognize and in what order. Most programs also let you save templates that describe the zone boundaries for a specific page layout. This can be a big time saver if you frequently scan the same page design.

Recognizing

This is the main event. When deciphering the bitmapped image from the scanner, an OCR program employs complex shape-analysis techniques to differentiate the components that make a character unique.

AccuText and the OmniPage series also provide *training* features you can use to teach the program to recognize unusual typefaces, special symbols, or defective or poorly scanned characters (see Figure 19-3 "Literacy Lesson"). There used to be a separate class of programs that required training to read anything other than a small range of sizes and fonts. Today's programs are of the *omnifont* variety, able to recognize a wide range of sizes and fonts.

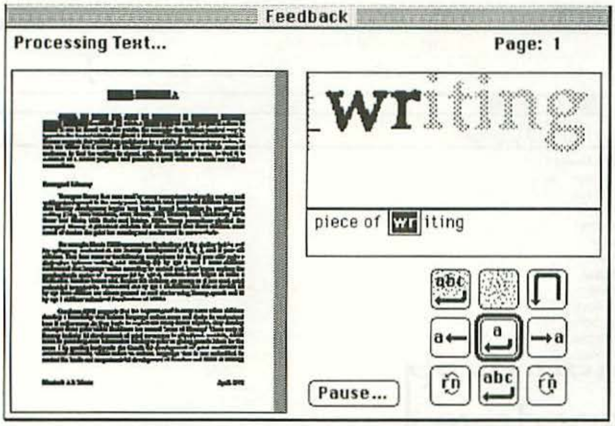


Figure 19-3: Literacy Lesson Using AccuText's verifier window to improve accuracy.

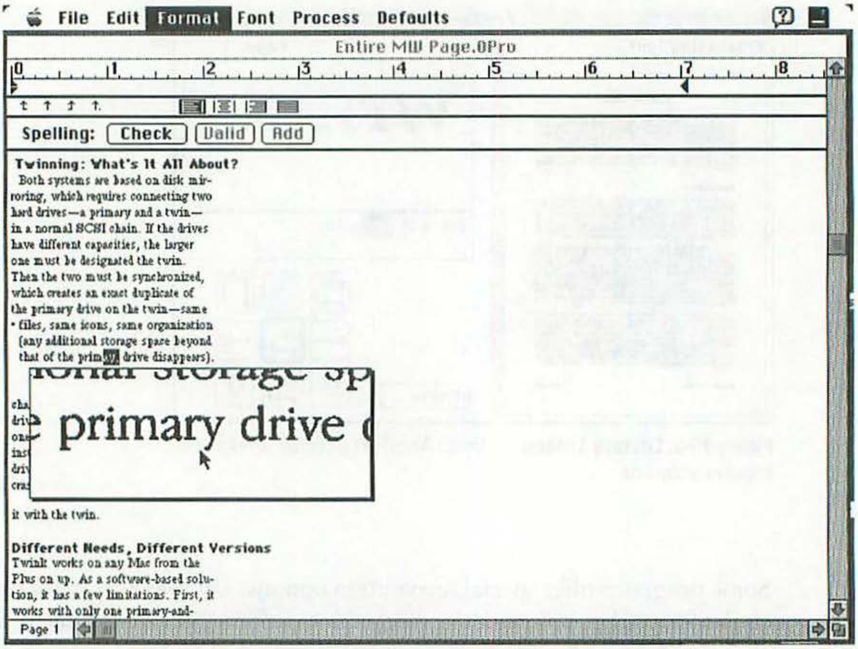
Some programs offer special recognition options. *Deferred recognition* lets you scan a stack of pages but postpone the recognition process until a convenient time — such as after you've gone home. *Background recognition* relies on System 7 or System 6 MultiFinder to let you switch to a different program while recognition occurs behind the scenes. That sounds appealing, but it's practical only if you have a fast Mac and at least 5MB of memory, preferably 8MB. Even then, your Mac may slow unacceptably as it juggles tasks.

Proofreading and polishing

Most programs display recognized text in a window where you can make corrections. Misread characters are indicated by a character such as an at-sign (@), bullet (•), or tilde (~). (You can specify a different character in case your original happens to contain a raft of at-signs or tildes.) By searching for these symbols, you can quickly locate obvious errors.

OCR errors can confound a word processor's spelling checker because they differ from conventional typographical errors. To address this, most programs provide spelling checkers geared toward OCR-oriented blunders. Xerox and Caere also sell foreign language dictionaries, and Caere sells medical and legal dictionaries.

OmniPage Professional has the best editing features. Besides enabling you to change fonts, sizes, and styles, its editing window has a ruler for specifying alignment and creating and adjusting tabs, margins, and first-line and hanging indents. You can also display a portion of the scanned page's bitmap to manually correct an error (see Figure 19-4 "Check the Original"). Many programs provide a similar feature.



Twinning: What's It All About?
Both systems are based on disk mirroring, which requires connecting two hard drives—a primary and a twin—in a normal SCSI chain. If the drives have different capacities, the larger one must be designated the twin. Then the two must be synchronized, which creates an exact duplicate of the primary drive on the twin—same • files, same icons, same organization (any additional storage space beyond that of the primy, drive disappears).

cha
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cra

it with the twin.

Different Needs, Different Versions
Twinit works on any Mac from the Plus on up. As a software-based solution, it has a few limitations. First, it works with only one primary-and-

Figure 19-4: Check the Original OmniPage Professional is among the programs that let you display the original bitmap for a section of a document. By doing so, you can see where the program has stumbled and determine how to manually correct the error. (Here, you can see that the touching *r* and *y* caused OmniPage Professional to misread the *y* as a *y* followed by a comma.) Also note the wide range of formatting features provided by OmniPage Professional's text-editing window.

Saving the file

Programs that can retain formatting information let you save recognized text in a variety of popular word processor formats. Many programs also support database- and spreadsheet-oriented formats such as SYLK.

AccuText includes a HyperCard stack called AccuStack that lets you import recognized text into a HyperCard stack. A single card can contain an entire document, a page, or even a zone from a page. If you've scanned a mailing list, you can create a stack in which each name and address is on its own card.

How OCR Programs Work

To turn pixels into pages, OCR programs employ a battery of complex analysis techniques (see Figure 19-5 "OCR Approaches Compared"). With the simplest recognition technique, *matrix matching*, the program compares each character to a library of templates, also called *type tables* or *matrices*, for specific fonts and type sizes. Think of those tests where kids insert different-shaped pegs into matching holes in a pegboard. Now imagine the OCR program trying to insert each character it has scanned into a hole shaped like a letter, number, or other symbol. When a character seems to fit a particular hole, the OCR program calls it a match.

QUICK TIPS

Improving OCR Accuracy

You can improve your OCR accuracy by following the guidelines outlined here. Some of these tips are based on the advice from the first-rate manual that accompanies ExperVision's TypeReader.

Keep the scanner clean

Spots and streaks on the scanner's glass can translate into recognition errors. Check your scanner's manual for recommendations on cleaning solutions and techniques.

Position the original carefully

If the original document is crooked, accuracy can suffer along with recognition speed. Your OCR program is also likely to have trouble decomposing the page into columns and paragraphs. If the text is straight on the page, use the scanner's guides to ensure the page is positioned properly. If the text itself is crooked, adjust the paper so that the text is scanned in straight. After scanning, use the OCR program's preview window to determine whether the text lines are straight. If they aren't, tweak the paper's position and try again.

Remove markings on pages

Handwritten notes on pages can slow down recognition. If the notes overlap the text, they can cause recognition errors. Use white-out to paint over markings. But avoid using white-out near the text itself: You may make the problem even worse. If you don't want to paint white-out on the original document, make a photocopy and touch it up; then scan the copy.

Coping with thin paper

Thin paper, such as newsprint, is translucent. The scanner's bright light may cause the type on the back side of the page to show through and become part of the page image. This can impair performance and accuracy.

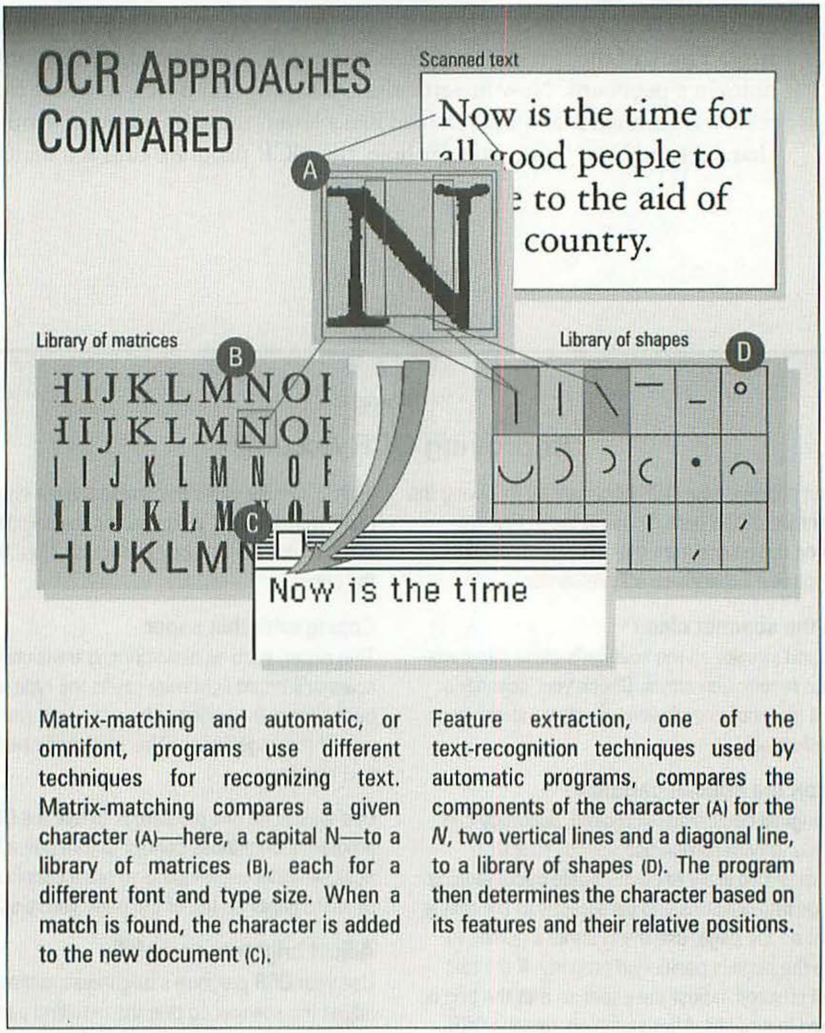
One way to fix this problem is to use the OCR program's brightness control to turn down brightness. Another technique is to put a couple of sheets of white paper on top of the page you're scanning.

Adjust brightness carefully

Use your OCR program's brightness settings to adjust the scanner so that the resulting page image is as crisp and clear as possible. If the scan is too dark, characters such as *o* and *e* will fill in. If the scan is too light, thin portions of characters will be lost, and an *O* will become ().

Create a user dictionary

If your program lets you add words to its spelling dictionary, do so. You'll spend less time cleaning up the resulting document.



Matrix-matching and automatic, or omnifont, programs use different techniques for recognizing text. Matrix-matching compares a given character (A)—here, a capital N—to a library of matrices (B), each for a different font and type size. When a match is found, the character is added to the new document (C).

Feature extraction, one of the text-recognition techniques used by automatic programs, compares the components of the character (A) for the *N*, two vertical lines and a diagonal line, to a library of shapes (D). The program then determines the character based on its features and their relative positions.

Figure 19-5: OCR Approaches Compared

Teaching your OCR program to read

Programs that offer training modes let you create your own digital pegboards for new fonts as you encounter them. But *trainable* means you train it, and that means work. It may take only a few minutes to train a program to read a document with one or two fonts, but it can take an hour or two to teach it to read a typical magazine page. The program can apply its newfound knowledge to future documents, but that's no consolation if you never need to scan those fonts and sizes again.

Still, there are applications for which a training mode is ideal. Consider a manuscript produced on a typewriter that types a defective character — for example, an *e* whose crossbar always prints too lightly. An automatic program will probably always misidentify the character as a *c*, but a trainable program can be taught to recognize it. Trainable programs are also well suited to large projects that involve a lot of scanning, such as books or catalogs. The program will be finely tuned to the fonts at hand, and that can boost performance and accuracy.

The omnifont advantage

Automatic, or *omnifont*, programs such as OmniPage Professional and TypeReader use a whole bag of recognition tricks to read just about any font and type size. With one such technique, *feature extraction*, the program studies the shape of a character's components — its stems, loops, bowls, and so on — and compares them to the program's internal knowledge of letterforms. For example, if an automatic program sees a character with a vertical stem that descends below the baseline and has a loop attached to its upper-right side, the program knows it's found a *p*. There are significant variations between fonts — some have ornamental serifs, some have heavier stems than others — but generalized descriptions like this one apply to all characters.

There are typefaces that bend these rules, and poor-quality documents that make them difficult to enforce. In such cases, an automatic program may resort to additional techniques such as *topographical analysis*, which examines the character's shape for recognizable characteristics, and *context recognition* (also called *context intelligence)*, which uses built-in rules and dictionaries that know, for example, that if the program recognizes *q*, the next character is likely to be *u*.

Scanning the Field

I've said little about the hardware half of the OCR equation — the scanner, which uses a mechanism not too different from a photocopier or fax machine to examine a page and create a digital image of its contents. I examine scanner technology in detail in Chapter 14, but from an image-scanning, not OCR, perspective. For now, here's a quick look at the field.

- *Flatbed scanners* The Apple OneScanner series look like small copiers, with a lid covering a piece of glass upon which you lay the original document. Flatbed scanners can accommodate books and other originals too thick to fit through a sheetfed scanner's rollers. For accuracy, it's important to keep the glass spotless. As mentioned elsewhere in this chapter, many scanners accept automatic document feeders, which hold a stack of pages and feed them to the scanner as needed — useful for high-volume OCR work.

- *Hand-held*, or *hand, scanners* These are small boxes you can roll across an original page. Costing only a few hundred dollars, hand scanners are inexpensive but have limitations. You need to move the scanner at a slow and steady pace — about an inch per second — to get good results, and you can scan only a few inches of a document at a time (see the Background box "Reading by Hand").

Meeting and Adjusting Your Expectations

When shopping for an OCR system, take along several test documents, preferably ones similar to the documents you plan to scan. Don't just take war-torn, barely legible documents in an attempt to stump the OCR software — you'll succeed. If you have trouble reading a page, an OCR program will too. That's especially true if the document contains any fine print: OCR programs have more trouble with it than I do.

Reading by Hand

If you can't justify or afford a flatbed scanner, you may consider a hand-held scanner such as Caere's Typist Plus Graphics, Logitech's ScanMan Model 32, or Thunderware's LightningScan Pro. Hand scanners look like huge mice and roll across an original document, scanning in swaths about four inches wide. And therein lies one rub: To scan text columns (or images) wider than the scanner, you must make multiple passes and then use the scanner's *stitching* feature to attach the swaths.

Getting a high-quality scan from a hand scanner can be a challenge. You must be careful to move the scanner steadily — about an inch per second — and not skew the image by tilting the scanner to the left or right. Scanning a page from a book or magazine is complicated by the binding (the manual for Typist Plus Graphics actually suggests that you tear pages out to scan them). And although the scanners themselves are small, they require external SCSI interfaces and power adapters, so they aren't practical PowerBook companions.

A hand scanner can be a workable alternative if you usually scan narrow columns or images anyway. Thunderware's LightningScan comes with Olduvai's ReadIt Personal (a version of ReadIt Pro) as well as a first-rate gray-scale image-processing program, MicroFrontier's Enhance. Logitech bundles Catch-Word Pro with the ScanMan, while Caere's Typist Plus Graphics includes Caere's own OCR software and The Graphic Editor.

For OCR work, Caere's Typist Plus Graphics is the best of the bunch. If you scan carefully, you can get OmniPage-caliber accuracy. Typist Plus Graphics is also the only package that can insert recognized text directly into an application.

Advice for accuracy

After you scan a test page, proofread it carefully. Some errors are easy to spot: A capital *D*, for example, can be misread as a vertical bar followed by a parenthesis |). And the OCR program itself flags characters it doesn't recognize, usually by substituting an at-sign (@), bullet (•), or tilde (~).

Substitution errors are the hardest to find. A *w* can become *vv*, an *m* can become *rn*, *S* can become *5*, and an italic *h* can become a *b* — to name only several ways OCR programs can suffer from mistaken identity. In a document I once scanned, OmniPage turned PS/2 (a model of IBM personal computer) into P512. Catching that kind of blunder requires not only a watchful eye, but an experienced one. A secretary unfamiliar with IBM computers might not know that P512 isn't a valid model number. And every field — from law to medicine to plumbing — has these kinds of specialized terms and ciphers.

The moral? No OCR program is 100 percent accurate, regardless of its developer's claims. But no typist is 100 percent accurate, either. If you approach OCR with the knowledge that the results will not be perfect and will require careful proofreading, you won't be disappointed.

I'm still swimming in paper

As for me, I'm sold on the keystroke-saving benefits of OCR, but I haven't made it a part of my day-to-day business life. I once fantasized about scanning all the press releases that litter my office, but I soon realized that it would take far too long to be practical. A hand-held scanner may streamline the process by enabling me to scan just the portions of a press release that interest me, but as I mentioned before, hand scanners are usually second-best OCR devices.

As mentioned in the Background box "Reading by Hand," Caere Corporation's Typist Plus Graphics is one hand scanner designed for OCR. Typist isn't as finicky about speed as other hand scanners and better still, Typist inserts the text it reads directly into whatever application you're using — no grappling with a separate OCR program, no cutting and pasting or fussing with file formats to move text into the program where it will ultimately be used. (OmniPage Direct has this advantage, too.)

It sounds appealing, but don't believe it until you see it in action with the types of documents you plan to scan. Indeed, that's a good way to approach OCR in general — believe it when you see it. And when you proofread it.

CHAPTER 19 CONCEPTS AND TERMS

- OCR software and a scanner enable the Mac to read, or recognize, printed pages and create files containing their text.
- Most OCR programs can retain formatting such as bold and italic as well as type-size information. You need a fast Mac with at least 5MB of memory for good performance, however.
- A typical OCR job has six phases — scanner setup (adjust brightness and resolution settings, specify format retention and page-decomposition modes); scanning (generate a bitmapped image of a page); text selection (specify which portion of a page you want to be recognized); recognition (sit back while the OCR program deciphers the text); clean-up (proofread and polish the resulting text file); and saving (store the recognized text in the desired file format).
- The scanner is the hardware half of the OCR equation; it uses a mechanism not too different from that of a photocopier or fax machine to examine a page and create a bitmapped image of its contents. Flatbed scanners can scan pages from books, magazines, and other bulky originals. Most scanners accept automatic document feeders that streamline multipage jobs. Hand-held scanners roll across a page and scan in narrow swaths. They're economical but finicky.

background recognition
An OCR program feature that relies on System 7 or System 6 MultiFinder to let you switch to a different program while recognition occurs behind the scenes.

context recognition
Also called *context intelligence,* a recognition technique that uses built-in rules and dictionaries that know, for example, that if the program recognizes a *q*, the next character is likely to be a *u*.

deferred recognition
An OCR program feature that lets you scan a stack of pages but postpone the recognition process until a convenient time.

feature extraction
A recognition technique in which the program studies the shape of a character's components — its stems, loops, bowls, and so forth — and compares them to the program's internal knowledge of letterforms.

matrix matching
A recognition technique that compares each scanned character to a library of templates.

omnifont
A term sometimes applied to OCR programs that can recognize a wide range of sizes and fonts.

page decomposition
An OCR program feature in which the program looks for areas of horizontal and vertical white space to differentiate columns and text blocks.

recognition
The phase of an OCR job in which the program examines the scanned version of a page and deciphers its contents.

substitution error
A hard-to-find type of OCR error in which the program substitutes one or more characters for another: For example, *w* can become *vv*, *m* can become *rn*, *S* can become *5*, and an italic *h* can become a *b*.

training
Teaching an OCR program to recognize unusual typefaces, special symbols, or defective or poorly scanned characters.

zoning
The process of telling the OCR program which columns you want to recognize and in what order.

CHAPTER TWENTY

HyperCard

IN THIS CHAPTER

- Looking at HyperCard's versatility and possibilities
- Designing effective HyperCard stacks
- Customizing HyperCard
- Creating stacks that run without HyperCard

HyperCard defies simple definitions. Call it a database manager, and you short-shrift its MacPaint-like painting features. Call it a paint program, and you ignore its ability to store and retrieve information. HyperCard isn't educational software or a game, but it can educate and entertain. It isn't part of the Mac's System Folder, but like the Finder, it can start applications and open documents. It isn't a programming language, but it has introduced thousands of people to the fun and frustration of programming.

Appreciating HyperCard's versatility is easier if you consider the code name it bore during its gestation — WildCard. In poker, a wildcard represents any card and can make a winning hand. Similarly, HyperCard can be sculpted into nearly any kind of application, thus rounding out your computing toolbox.

In this chapter, I examine this software wildcard and spotlight some of the stellar ways in which HyperCard has been used. For those who haven't gone beyond browsing around in HyperCard, I include a short exercise that introduces customizing basics.

The Three Keys to HyperCard

ON THE CD

- Virus Reference stack
- HyperCard stacks in the Best of BMUG collection and from The Voyager Company, France and Associates, and others
- Connectix Macintosh Memory Guide
- XCMDs and XFCNs from Software Perspectives

Three factors combine to give HyperCard its wildcard versatility — its card-and-stack metaphor, its painting features, and its built-in programming language, *HyperTalk*.

Cards and stacks

HyperCard presents and stores information on cards. In an electronic address book, for example, each person's name and address is stored on its own card. Cards that accept information from you contain *fields*, each of which stores a piece of information, such as a name or a phone number. A card can also contain *buttons* — hot spots you click on to perform an action, such as moving to a different card for more information. A collection of related cards — such as all the cards in the address book — form a *stack* (see Figure 20-1 "Fields, Cards, and Stacks"). You can have numerous stacks open simultaneously; each appears in its own window.

A card can be any size up to 18 inches tall or wide. (In HyperCard 1.*x*, card sizes were fixed to match the size of a 9-inch Macintosh screen.) You specify card dimensions in the dialog box that appears when you choose New Stack from the File menu.

Painting tools

HyperCard's painting tools are similar to the ones provided by all painting (bitmapped) programs — besides the electronic eraser, pencil, and spray can, there are tools for creating rectangles, ovals, lines, and text. You can create text and graphics on individual cards or on backgrounds, which appear beneath cards in a stack (see Figure 20-2 "In the Background").

You can also paste graphics from the Clipboard to create a scrapbook of drawings — or to store a scanned photo of each person listed in your address book. HyperCard 2.0 and later versions also enable you to display color PICT images in separate windows. And software add-ons are available that let you play QuickTime movies within stacks.

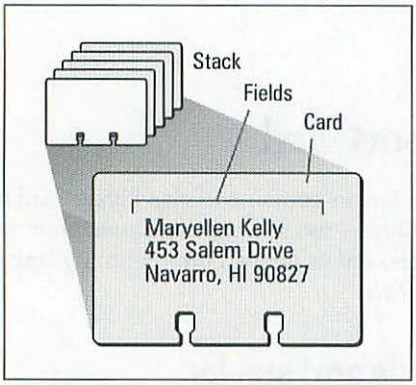


Figure 20-1: Fields, Cards, and Stacks HyperCard presents and stores information on cards. Cards that accept information from you contain fields. A collection of related cards forms a stack.

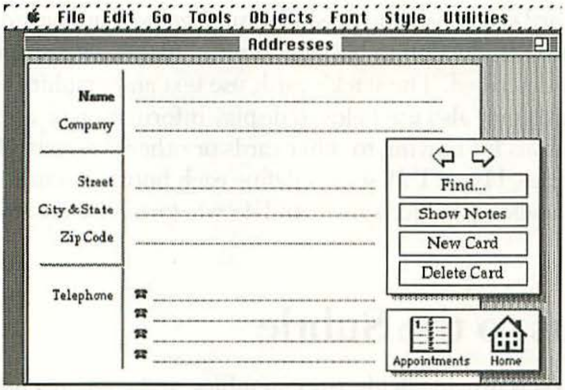
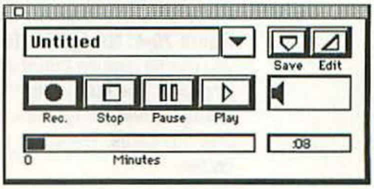


Figure 20-2: In the Background A stack's background holds fields, graphics, and buttons that appear on every card (in this case, HyperCard's Addresses stack). To view a stack's background, choose Background from the Edit menu. HyperCard displays stripes in the menu bar to indicate that you're working with the background.

Tying it together with HyperTalk

HyperTalk ties HyperCard's features together. By creating HyperTalk *scripts* — short command sequences that control HyperCard's actions — you determine how a stack responds to its users. A script for a button named Next may tell HyperCard to advance to the next card when the button is clicked. A script for a field named Date may tell HyperCard to display an error message if someone enters an invalid date, such as February 31. You can also design HyperCard scripts to control videodisc players, CD-ROM drives, and music synthesizers, or to play digitally recorded sound (see Figure 20-3 "Hearing HyperCard"). I spotlight some of these advanced applications of HyperCard when I examine multimedia in the next chapter.

Figure 20-3: Hearing HyperCard The easiest way to record sounds for playback in HyperCard is to use a Mac that includes sound-recording circuitry and a microphone. These Macs include the HyperCard Audio Palette (shown here), which lets you add sounds to HyperCard stacks. For other Macs, you can use Macromedia's MacRecorder Sound System Pro — its SoundEdit application lets you record sounds and modify them using numerous digital effects. For more ambitious applications of digital audio, there's The Voyager Company's Voyager CD AudioStack, which enables HyperCard to play audio from a compact disc in a CD-ROM drive. With the tools in the AudioStack, you can create HyperCard stacks that incorporate the audio from a CD. See Chapter 22 for more details on Mac audio products.



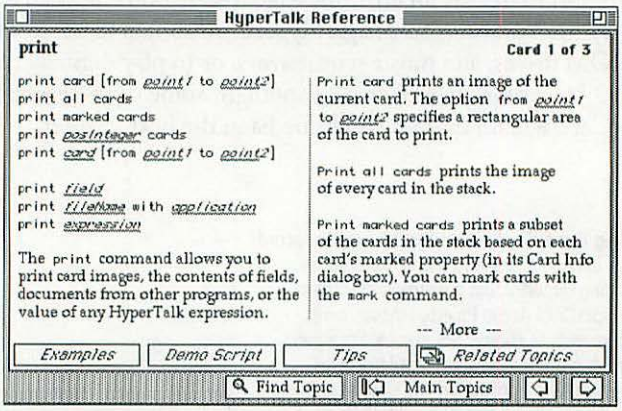
A complete HyperCard stack — be it a business-management application, a children's story, or an introduction to bird anatomy — makes extensive use of the three elements I just described. The stack's cards use text and graphics to convey information. The cards may also use fields to display information or accept new information, and buttons for moving to other cards or otherwise controlling the stack. Behind the scenes, HyperTalk scripts define each button's action, calculate numbers, display messages, produce sound, and do whatever else the stack requires.

From the Obvious to the Subtle

If all HyperCard did was provide fields, store graphics, and contain a programming language, it would be no different than many Mac database managers. What makes HyperCard different is the myriad ways its components can work together. Everything in HyperCard seems to have obvious applications and subtle ones.

Buttons that open doors

Take buttons, for example. Their obvious use is to provide icons for moving to the next or the previous card, or for returning to the *Home stack.* (The Home stack serves as your base of operations in HyperCard — just as the Finder does for the Mac.) Navigation buttons often appear as icons, and always have HyperTalk scripts that run when the buttons are clicked (see Figure 20-4 "Navigation Buttons").



print

Card 1 of 3

```
print card [from point1 to point2]
print all cards
print marked cards
print posInteger cards
print card [from point1 to point2]

print field
print fileName with application
print expression
```

The `print` command allows you to print card images, the contents of fields, documents from other programs, or the value of any HyperTalk expression.

`Print card` prints an image of the current card. The option `from point1 to point2` specifies a rectangular area of the card to print.

`Print all cards` prints the image of every card in the stack.

`Print marked cards` prints a subset of the cards in the stack based on each card's marked property (in its Card Info dialog box). You can mark cards with the `mark` command.

--- More ---

Figure 20-4: Navigation Buttons In this HyperTalk Reference stack, you use navigation buttons to access information about the HyperTalk language. The buttons at the bottom of the window let you display examples and related topics, search for topics, and move to the next and previous cards. The script for the button named Examples is shown at bottom.

You can specify that a button not have an icon or text, but be *transparent.* By placing transparent buttons over key portions of a graphic, you can define a relationship between each area of the graphic and other cards, fields, or stacks. Thereafter, when you click on a portion of the graphic, HyperCard takes you to a different card or stack.

Many educational stacks use this technique. One superb example is a stack called Bird Anatomy, created by Yale University's Patrick Lynch and published by The Voyager Company (an earlier version of Bird Anatomy is available through user groups and on-line services). This stack combines beautifully drawn images with transparent buttons that, when clicked, display additional details on avian anatomy (see Figure 20-5 "See-Through Buttons").

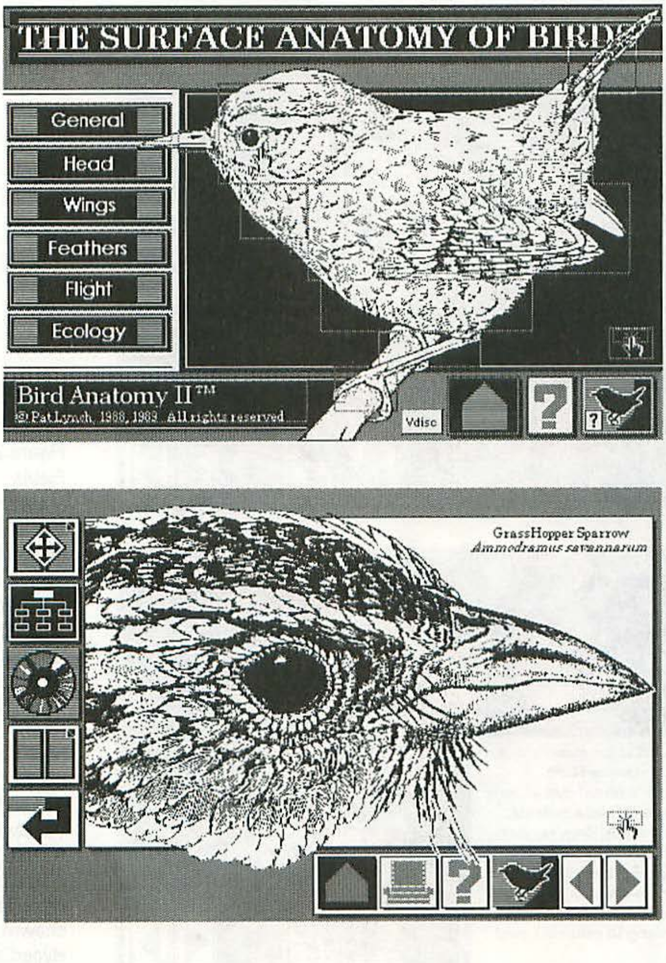
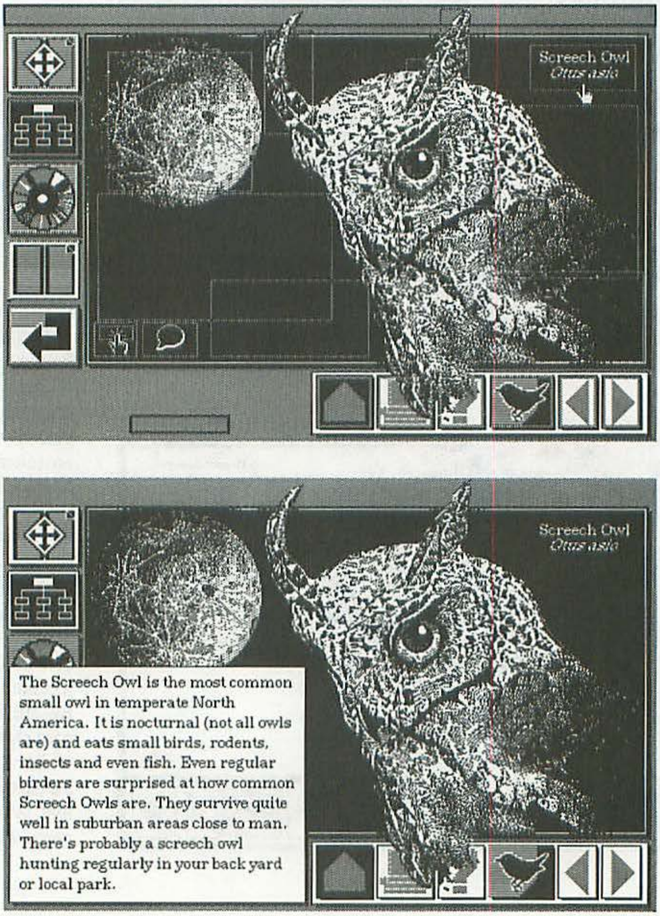


Figure 20-5: See-Through Buttons In Patrick Lynch's Bird Anatomy II stack, transparent buttons are placed over key anatomical areas and become temporarily visible when you press ⌘-Option. Here, the Browse tool is pointing at the button whose HyperTalk script appears above the screen (top). Clicking this button tells HyperCard to go to the card shown at bottom, which also contains transparent buttons that, when clicked, reveal additional details.

On the lighter side, Amanda Stories, a delightful series of children's stacks by Amanda Goodenough, uses buttons to enable kids to travel through the worlds of Inigo the Cat and Your Faithful Camel. Amanda Stories are also published by The Voyager Company. The freeware version of Inigo Gets Out is also available through user groups and on-line services.

Fields of dreams

Fields have their obvious and subtle uses. As in any database manager, they accept and store information. But they can also serve as read-only, role-displaying text you can't edit: They can also be displayed or hidden using HyperTalk scripts. Combine both traits with buttons, and you have another way to convey information — ***pop-up fields*** that appear when you click a button (see Figure 20-6 "Pop-Up Fields").



The Screech Owl is the most common small owl in temperate North America. It is nocturnal (not all owls are) and eats small birds, rodents, insects and even fish. Even regular birders are surprised at how common Screech Owls are. They survive quite well in suburban areas close to man. There's probably a screech owl hunting regularly in your back yard or local park.

Figure 20-6: Pop-Up Fields Pop-up fields are an ideal way to convey small tidbits of information. Shown here is another card from Bird Anatomy II. Clicking the Screech Owl button executes the HyperTalk scripts shown about the card (top), which plays back a digitized recording of a screech owl and then displays the card field shown at bottom. That card contains another HyperTalk script (not shown) that causes HyperCard to hide the field when you click it.

You can mix fonts, sizes, and styles within a single field. You can also specify that a word (or sentence or paragraph) act as a hot spot upon which users can click to go to a different card, for example, or display a definition for a term.

Buttons and fields can appear on individual cards or on the background. Stack-navigation buttons are usually on the background, so they appear on each card and provide a consistent way for you to navigate. Transparent buttons that lead to other cards or display pop-up fields generally appear on individual cards and correspond to a graphic.

So You Want to Be an Author

Because the best way to learn about HyperCard is to play with it, I put together an exercise that exposes you to HyperCard customizing. For a hands-on introduction to *authoring* — the fashionable term for HyperCard customizing — see the Step-by-Step box "A HyperCard Tutorial" and Figure 20-7 "HyperCard's Tools."

Reading some scripts

You may think this exercise is too simple, that HyperTalk scripts are usually longer. Not so. HyperTalk is an efficient language; scripts rarely exceed 10 or 20 lines, and often have just a few. To see for yourself, explore the scripts in HyperCard's stacks (see Figure 20-8 "HyperCard User Levels"). To quickly open any button's script, press ⌘ and Option while clicking on the button. (Note that your user level must be set to 5, the Authoring level, for this to work.)

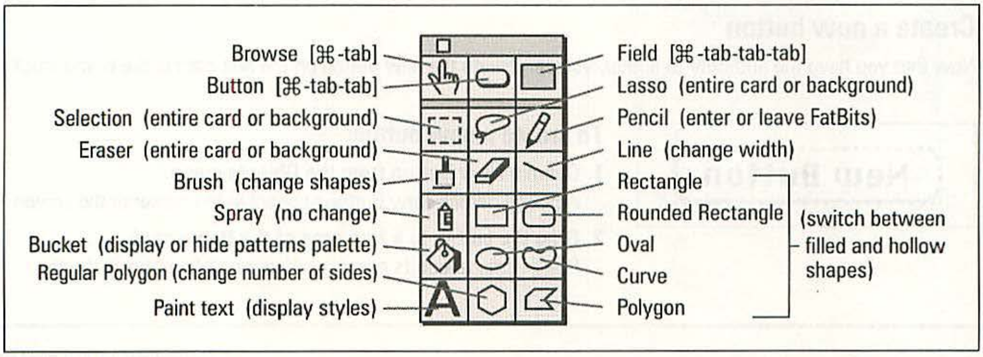

Browse [⌘-tab]
Button [⌘-tab-tab]
Selection (entire card or background)
Eraser (entire card or background)
Brush (change shapes)
Spray (no change)
Bucket (display or hide patterns palette)
Regular Polygon (change number of sides)
Paint text (display styles)
A
Field [⌘-tab-tab-tab]
Lasso (entire card or background)
Pencil (enter or leave FatBits)
Line (change width)
Rectangle
Rounded Rectangle
Oval
Curve
Polygon
(switch between filled and hollow shapes)

Figure 20-7: HyperCard's Tools HyperCard's Tools menu is the gateway to many of its painting and stack-design features. To access the secondary functions shown in parentheses, double-click the appropriate tool. In HyperCard versions 1.2 and later, you can select the Browse, Button, and Field tools using the key commands shown in brackets.

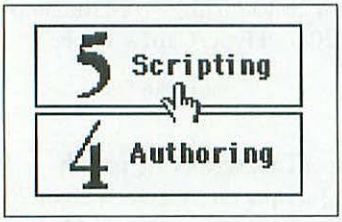
STEP-BY-STEP

A HyperCard Tutorial

In this exercise, you exploit HyperCard's ability to start other programs by adding a button to HyperCard's Home card that, when clicked, uses a HyperTalk script to take you to the word processor of your choice. You must know the exact name of your word processor as it's stored on your hard disk. If you aren't sure, return to the Finder and find out. And finally, for insurance, you may want to use the Save a Copy command in HyperCard's File menu to make a backup copy of your Home stack.

Changing your level

You can use HyperCard on any of five levels, each of which provides more access to HyperCard's customizing features than the one before it. To work with HyperTalk, go straight to the most powerful level — the scripting level. (See Figure 20-8 "HyperCard User Levels," which follows this sidebar.)



To change the user level:

1. **With the Home stack open, choose Preferences from the Home menu to display the User Preferences card.**
2. **Click the Scripting button in the User Preferences card.**
   Two new menus, Tools and Objects, appear. HyperCard's Tools menu contains its painting, button, and field tools (see Figure 20-7 "HyperCard's Tools"). The Objects menu lets you create, examine, and change information and scripts for buttons, fields, cards, backgrounds, and stacks.
3. **Return to the first card of the Home stack by choosing Home Cards from the Home menu.**
   HyperCard remembers which user level you chose, so you need only perform these steps once.

Create a new button

Now that you have the authority to author, you can create the new button on the first card of the Home stack.

To create a new button:

1. **Choose New Button from the Objects menu.**
   A button named New Button appears in the center of the screen.
2. **Drag the button to a free area of the Home card.**
   Don't worry about its exact position; you'll fine-tune it shortly.

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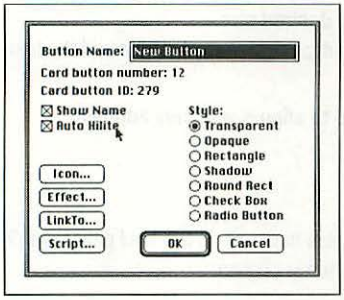
Refine the button

Your next step is to make the button look like the other buttons in HyperCard's Home stack — icons with text below them.



Button Name: New Button

Card button number: 12

Card button ID: 279

☒ Show Name

☒ Auto Hilite

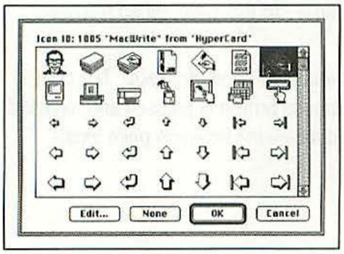
Style:
- ● Transparent
- ○ Opaque
- ○ Rectangle
- ○ Shadow
- ○ Round Rect
- ○ Check Box
- ○ Radio Button

To edit the button:

1. **Choose Button Info from the Objects menu, or simply double-click the new button and HyperCard's Button Info dialog box appears.**
2. **In the Button Name text box, type your word processor's name exactly as it's stored on disk.**
   Because the dialog box's Show Name option is checked, the button name will appear on the card.
3. **Click the Auto Hilite check box.**
   This tells HyperCard to invert the button (turn white areas black and vice versa) when you click it. This way, the button provides visual feedback and operates like a standard Macintosh button.
4. **In the Style area of the dialog box, choose the Transparent option. Don't click OK yet.**
   When using this option to create an invisible button over a graphic, uncheck the Show Name option.

Add an icon

Next, you can add an icon to the button from one of the dozens built into HyperCard.



Icon ID: 1005 'MacWrite' from 'HyperCard'

To add an icon to a button:

1. **In the Button Info dialog box, click the Icon button.**
   A dialog box showing HyperCard's built-in icons appears. For your word processor, use the icon located in the upper-right corner of the dialog box.
2. **Select the icon you want by clicking it, and then click the OK button.**
   The button changes to reflect its new icon. But because the button is rectangular, it obscures part of the icon. In the next steps, you'll resize the button to see the entire icon, and you'll fine-tune the button's position.

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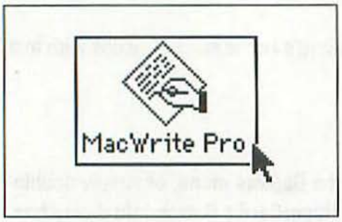
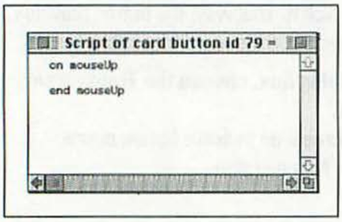


To resize a button:

1. **Be sure the button tool is active and that the button is selected.**
2. **Point to any of the button's four corners, and then click and drag until the button is the desired size.**
   In this example, resize the button until the entire icon and the text below it appears.
3. **Drag the button as needed to align it with any adjacent buttons.**

Create the script

If you click on the new button now, HyperCard highlights it, but nothing else happens. In this final phase, you'll create the HyperTalk script that tells HyperCard what to do when the button is clicked.



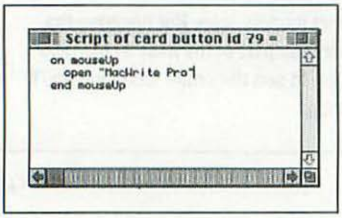
```
on mouseUp
end mouseUp
```

To create the script:

1. **Choose the button tool from the Tools menu.**
2. **Double-click your new button to reopen the Button Info dialog box.**
3. **Click the Script button.**
   HyperCard's script editor window appears.

Before you type a script, here is some background on scripts:

- A script consists of one or more *handlers.* A handler is a collection of HyperTalk statements that are executed when HyperCard receives a message that an event has occurred — in this case, when the new button has been pressed.
- A message handler for a button always begins with *on mouseUp* and ends with *end mouseUp.* The commands between these two lines tell HyperCard what to do when the mouse button is pressed and released while the browsing pointer is within the button's boundaries. Note that a blinking insertion point exists between the two lines. You type the script there.



```
on mouseUp
  open "MacWrite Pro"
end mouseUp
```

To type the script:

1. **Type (include the quotes)** open "Microsoft Word" **(or the name of the word processor of your choice, as it's stored on your hard drive).**
   Be sure to type the name exactly as it appears in the Finder.
2. **Check your work, and then click the script window's close box and click Yes when asked to save changes.**

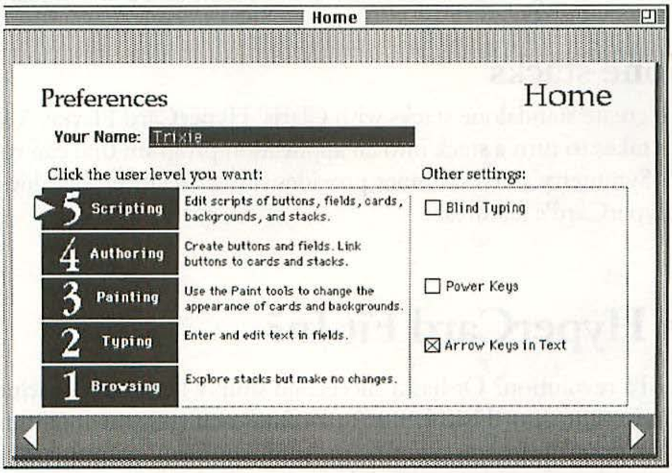
(continued on the next page)

(continued from the previous page)

3. **Choose the browse tool — the pointing finger — from the Tools menu, or from the keyboard by pressing ⌘-Tab.**
   Test the button now. Depending on how you've organized your disk folders, one of two things will happen: HyperCard will dutifully start the word processor, or a dialog box will appear asking where the application is stored. If the latter happens, use the dialog box to aim HyperCard in the right direction. From now on, HyperCard will look for applications in that folder. (By editing the Search Paths cards in the Home stack, you can also add path names to the list of folders that HyperCard automatically searches.)

Extending HyperCard's vocabulary

HyperTalk contains a large vocabulary, but no programming language meets every need. Knowing that, HyperTalk's designers devised a way for HyperTalk to access routines written in conventional programming languages. These *external commands* (XCMDs) and *external functions* (XFCNs) can perform specialized jobs that exceed HyperTalk's capabilities, such as controlling a videodisc player or CD-ROM drive.



Your Name: Trixie

Click the user level you want:

▶ 5 Scripting — Edit scripts of buttons, fields, cards, backgrounds, and stacks.
4 Authoring — Create buttons and fields. Link buttons to cards and stacks.
3 Painting — Use the Paint tools to change the appearance of cards and backgrounds.
2 Typing — Enter and edit text in fields.
1 Browsing — Explore stacks but make no changes.

Other settings:

☐ Blind Typing
☐ Power Keys
☒ Arrow Keys in Text

Figure 20-8: HyperCard User Levels HyperCard offers five user levels, each providing more access to HyperCard's programming and customizing features than the level beneath it. The Blind Typing option lets you type messages without having to open the message box. Checking the Power Keys option enables HyperCard's power keys, a number of keys on the keyboard you can press to choose a command when a paint tool is active.

Hundreds of free or inexpensive XCMDs and XFCNs are available from user groups and on-line services such as America Online and CompuServe. Libraries of XCMDs and XFCNs are also available from a variety of sources, including Heizer Software (415-943-7667), Trendware (203-926-1116), Clear Lake Research (713-523-7842), TechAlliance (206-251-5222), and APDA, Apple's source for developer tools (800-282-2732; 408-562-3959 international).

Learning HyperTalk

A variety of excellent books is available to help teach you HyperTalk. The best place to start is with the extensive documentation that accompanies the version of HyperCard that Claris sells. (At least it's sold by Claris as of this writing. Future versions of HyperCard will be marketed by Apple.)

Going the Plus or SuperCard route

As you become proficient with HyperCard and HyperTalk, you may want to sample one of the HyperCard-like programs available for the Mac — Spinnaker Software's Plus or Aldus SuperCard. Both products can open and convert HyperCard stacks and provide some features HyperCard lacks. SuperCard boasts impressive animation features and the ability to create standalone applications (ones that users can run directly from the Finder, without having to open them using SuperCard). SuperCard and Plus provide more support for color and object-oriented graphics than does HyperCard. And Plus is also available for the IBM PC, enabling you to develop stacks that can be used by Mac and PC users alike.

Standalone stacks

You can also create standalone stacks with Claris' HyperCard Player. A few mouse clicks is all it takes to turn a stack into an application program that can run without HyperCard. Symmetry's StackRunner provides similar features, but doesn't support all of HyperCard's features.

Where Does HyperCard Fit In?

Is HyperCard a revolution? Or has it succeeded simply because it's included with the Mac? I'm less impressed by HyperCard's data-management applications than I am by its educational and entertainment possibilities. Database managers, personal information managers, and even spreadsheet packages are better filing programs.

But for presenting information — as a medium for electronic publishing — HyperCard excels. And it's a boon to people who want to tinker with buttons and other aspects of the Mac interface without grappling with conventional programming.

QUICK TIPS

Stack Design Tips

Knowing your way around HyperCard and HyperTalk doesn't guarantee you stunning stacks. The best guide to stack design I've seen is Apple's *Stack Design Guidelines* (Addison-Wesley, 1990). Its nine basic guidelines, summarized here, provide sound advice for budding stackware authors.

Determine your audience

Do they have experience with computers and HyperCard? Imagine designing stacks about dinosaurs for kids and for paleontologists. How would the stacks differ?

Focus the subject matter

Decide how detailed the stack will be. From this, you'll get ideas about how to present it. Your decisions may be influenced by disk space and scheduling considerations.

Decide how to present the subject

Doodle on paper and on screen. Solicit opinions. Consider a metaphor. A book metaphor may use a table of contents as a gateway to various cards. A videotape metaphor may use on-screen rewind, stop, play, and fast-forward buttons.

Teach people how your stack works

Provide help screens that explain the stack's workings, but make them unobtrusive so experts won't be slowed down.

Make the stack easy to navigate

Consider how users will access other cards. Put key navigation buttons on backgrounds so they appear in the same place on each card. Use visual effects such as dissolves and wipes to convey a sense of movement within a stack.

Integrate text, graphics, and audio design

Avoid amateurish graphics and sound effects. Use text sparingly. Put navigation buttons near the screen edge.

Refine the stack as you work

As Apple says: "Your goal should be to produce the best possible stack, not to defend your first beloved idea." Make changes as you think of new presentation styles and navigation methods.

Test early and often

Don't wait until the stack is done before soliciting feedback from users to find out where they and you are stumbling.

When you've finished, check the stack again

Make sure there are no typographical or grammatical errors, and that all your buttons, dialog boxes, and scripts work.

Another way to assess HyperCard's significance may be to ask someone who has learned to read thanks to a stack called Alphabet for Adults by Michael Giamo. Developed for Drexel University's adult literacy program, this stack combines graphics and digitized sound to familiarize users with letters and words.

A software wildcard that teaches adults to read: Who can say that isn't revolutionary?

CHAPTER 20 CONCEPTS AND TERMS

- Three factors combine to give HyperCard its versatility — its card-and-stack metaphor, its painting features, and its built-in programming language, called HyperTalk.
- By attaching HyperTalk scripts to buttons, fields, and text within fields, you can create on-screen hot spots which users can click to navigate within a stack and otherwise control its operation.
- Specialized jobs that exceed HyperTalk's capabilities can be performed by external commands (XCMDs) and external functions (XFCNs). These are software routines, created with conventional programming languages, that extend HyperCard's capabilities.

authoring
The fashionable term for HyperCard customizing.

background
A special painting layer that appears beneath cards in a stack. Backgrounds contain images as well as buttons and fields.

button
An on-screen hot spot you click to perform an action, such as moving to a different card for more information. Generally, when you click a button, HyperCard executes the script that's attached to that button.

card
HyperCard presents and stores information on cards.

external command (XCMD)
Pronounced *ex-command,* an XCMD is a software routine created in a conventional programming language and installed in a HyperCard stack that extends HyperTalk's capabilities — to control a CD-ROM player, for example.

external function (XFCN)
Pronounced *ex-function,* an XFCN is a software routine, created in a conventional programming language and installed in a HyperCard stack that extends HyperTalk's capabilities.

field
A named container that stores a piece of information, such as a name or a phone number.

handler
A collection of HyperTalk statements that are executed when HyperCard receives a message that an event has occurred.

Home
A stack that serves as your base of operations in HyperCard — just as the Finder does for the Mac.

HyperTalk
HyperCard's built-in programming language. Using HyperTalk, you can create scripts and attach them to buttons, fields, cards, and stacks.

script
A sequence of HyperTalk statements that controls HyperCard's actions. For example, a script for a button named Next may tell HyperCard to advance to the next card when the button is clicked.

script editor
The HyperCard window in which you type, edit, and debug scripts. You can open the script editor window for a button by pressing the ⌘ and Option keys while clicking the button.

scripting level
Level 5 in HyperCard's Preferences card — the HyperCard operating level that lets you create HyperTalk scripts.

stack
A collection of related cards — such as all the cards in the address book.

transparent
A property that you can give a button so that the image beneath it remains visible. By placing transparent buttons over key portions of a graphic, you can define a relationship between each area of the graphic and other cards, fields, or stacks. Thereafter, when you click on a portion of the graphic, HyperCard takes you to a different card or stack.

CHAPTER TWENTY-ONE

Multimedia and QuickTime

IN THIS CHAPTER

- Exploring the applications and implications of interactive multimedia
- Outfitting a multimedia system
- Looking at animation and special-effects software
- Introducing the Mac to television with QuickTime
- Reducing QuickTime's disk-space requirements

Multimedia is many things — literally and figuratively. Literally, multimedia is the integration of more than one communications medium. It's the use of words, sounds, and still and animated pictures to convey ideas, sell products, educate, and entertain. It's built around the premise that anything words can do, words, sounds, and pictures can do better. The more, the media.

Figuratively, what multimedia is depends on who you talk to. Some say it's the future of computing, a harbinger of an era when computers will convey information using sound and motion as well as text and static images, and when television will become more interactive and less passive. Some say multimedia is the future of communication itself, the ideal way of conveying the complex ideas and concepts of the twenty-first century.

But others say multimedia represents the victory of television over literature, the triumph of sound bites and flashy visuals over the slow-moving but more thought-provoking printed word. Multimedia, they say, is just one more technological diversion for a society addicted to entertainment and distracted by trivia.

ON THE CD

- Adobe Premiere
- Gryphon Morph
- Macromedia Authorware Professional
- QuickTime movies
- HyperMovie Player
- Passport Producer

Multimedia is many things, and it can be all these things. It brims with potential and the potential for misuse. Multimedia can also be technically complex and, in its most advanced forms, quite expensive. In this chapter, I explore the world of multimedia, spotlighting some ways in which it's used as well as the components that form a complete system.

The Multi Levels of Multimedia

At its most basic level, multimedia may involve jazzing up a slide presentation with background music or narration. This kind of multimedia doesn't require a great deal of equipment or technical expertise. You can create title slides and other visuals using a presentation program such as Aldus Persuasion or Microsoft PowerPoint, and then use a stereo cassette deck to record and play the soundtrack. Not long ago, the combination of soundtrack and visuals was about all there was to multimedia.

Visual effects

Today, multimedia generally means using an *authoring* program such as HyperCard or Macromedia Director or Authorware Professional to create a production and play it back. Using such a program enables a production to have animation, such as bullet chart items that slide onto the screen, and flashy transitions, such as dissolves and fade-outs between visuals. Creating a presentation that uses these basic visual tricks isn't difficult, but the results can be livelier and more engaging than a simple slide show.

QuickTime animation

A more advanced level of multimedia may involve using QuickTime animation sequences that illustrate complex concepts, such as how a steam engine works or how heart valves operate. At this level, your role as producer becomes more demanding. Designing and executing a complex animated sequence requires artistic skills and some knowledge of animation techniques. It also requires software with more advanced animation features than HyperCard's — more about that later.

Capturing video

A sophisticated multimedia production may also incorporate moving or still images captured from a video camera or videocassette recorder. A corporate presentation may include shots of the new factory; a medical tutorial may show images captured from a videotape of a surgical operation. For this, you need additional hardware and software — not to mention some knowledge of video and lighting techniques.

Sound recording

Then there's sound, which authoring programs support in a few ways. They can play back short sound passages you record directly into the Mac using the recording circuitry built into most Mac models or by using an add-on such as Macromedia's MacRecorder Sound System Pro. So, your animated heart can beat to the sound of a recorded heart, and the animated steam engine can chug as a locomotive sound plays. Authoring programs can also control electronic synthesizers and CD-ROM players. Thus, a corporate presentation can play to the sound of CD-quality background music, or a music tutorial can display text on the screen while a piece plays.

Passive Versus Interactive

Multimedia productions can be linear affairs — watched from start to finish, like a slide show or a TV program. But the most significant aspect of Mac multimedia — and the thing that gets its evangelists and doomsayers so excited — is *interactivity.* The most advanced multimedia productions are nonlinear and interactive. Instead of passively sitting through them from beginning to end, you use the Mac to interact with them, setting your own pace and branching to different topics and areas as they interest you.

Tools for interacting

With interactive multimedia, the Mac and programs like HyperCard become more than devices that present various media — they become tools for navigating through the media themselves. The primary tools of multimedia navigation are on-screen buttons and other on-screen hot spots that, when clicked, take you to other screens, display windows containing additional information, or play sounds or even video sequences.

Videodiscs

Many multimedia producers rely on Apple's QuickTime to display video on the Mac's screen, but interactive multimedia can also make use of yet another piece of hardware, a videodisc player, whose discs look like a cross between a phonograph album and a compact disc.

Videodiscs and interactive multimedia complement each other beautifully, primarily because, unlike a videocassette, a videodisc is a random-access medium. One side of a videodisc contains 54,000 numbered *frames,* and a player under the Mac's control can skip to any one of them almost instantly. The player can play frames continuously to show up to 30 minutes of moving footage, or freeze on any one frame to show a still.

Thus, a multimedia production can include moving and still pictures stored on the same videodisc — along with up to 30 minutes of two-channel audio per side. Those two audio channels can be used for stereo, or they can be used separately to hold, for example, narration in two languages.

Multimedia in Education

Clearly, interactive multimedia has tremendous potential as an educational tool. Nowhere is this better illustrated than in a series of videodisc packages produced by ABC News Interactive and Optical Data Corporation. In the Martin Luther King, Jr. package, you use HyperCard to explore a videodisc brimming with footage of civil rights protests, vintage news reports, and King's speeches, as well as still photographs, maps, and charts (see Figure 21-1 "Interactive History"). You can watch the entire "I Have a Dream" speech while reading King's prepared text on the Mac's screen — and you can see where, half-way through, he diverged from the prepared text to capture the attention of millions.

Other ABC News Interactive presentations include *In the Holy Land, The Great Quake of '89,* and *AIDS.* The state of Florida has distributed the latter package along with videodisc players to all its schools.

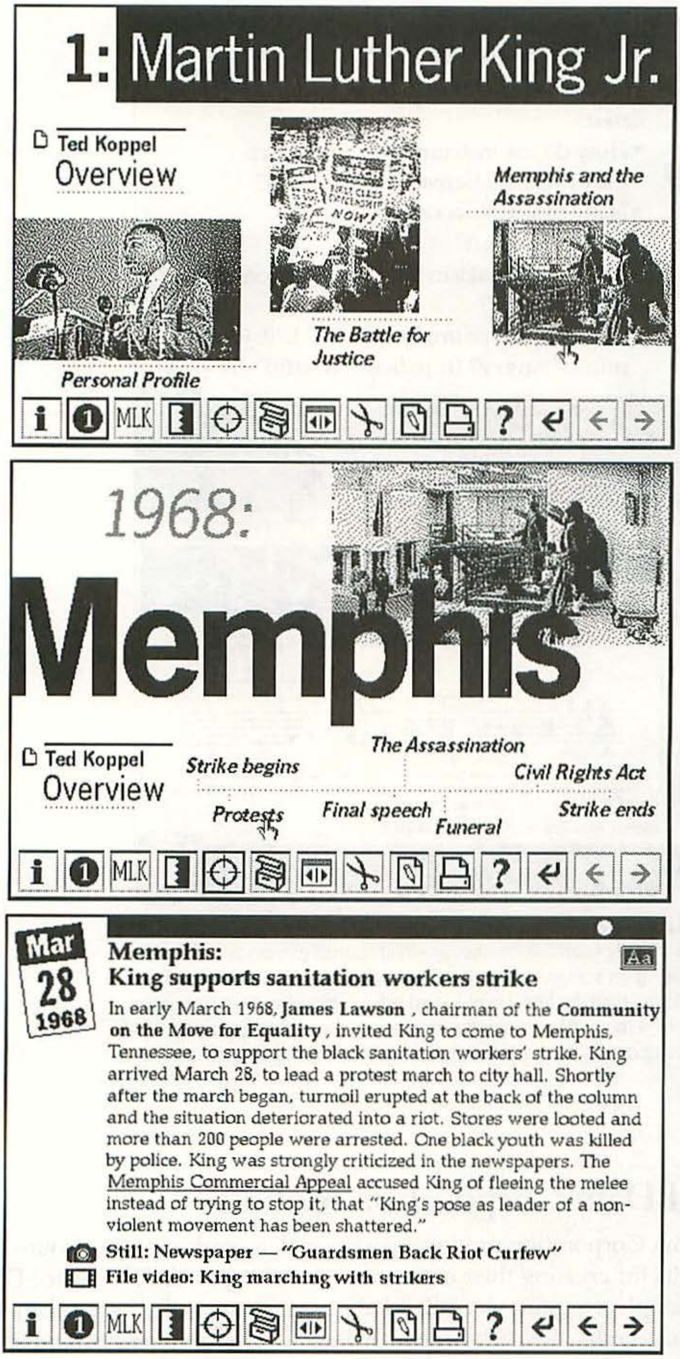
Documentary Production 101

Each package in the ABC News Interactive series also includes a *documentary maker* that lets students assemble their own documentaries based on the videodisc's images and news footage. It's this feature that also raises red flags among interactive multimedia critics, who wonder, Are students learning about Martin Luther King, Jr., or are they learning how to produce TV documentaries and splice sound bites? Are they learning about AIDS? Or are they learning that "learning can take the form of an entertainment and ought to," in the words of professor and media critic Neil Postman, author of *Amusing Ourselves to Death: Public Discourse in the Age of Show Business* (Penguin, 1985).

Music appreciation

Another example of interactive instructional media is Warner New Media's Audio Notes series, which uses CD-ROM discs and HyperCard to enable you to listen to and learn about music. One three-disc package presents Mozart's opera *The Magic Flute;* a one-disc package called *The String Quartet* presents a Beethoven string quartet. As the latter plays, you can use an accompanying HyperCard stack to view any of several measure-by-measure commentaries on the music, each assuming different levels of musical knowledge (see Figure 21-2 "Listen and Learn").

Other parts of the stack contain biographical information on Beethoven and additional tutorials on music theory. In The Voyager Company's *Igor Stravinsky: The Rite of Spring,* a UCLA music professor provides real-time analysis and commentary as the ballet plays. Whether you're a music student or a casual listener, a few minutes with any of these products will give you a new appreciation for the music and for the potential of interactive multimedia.



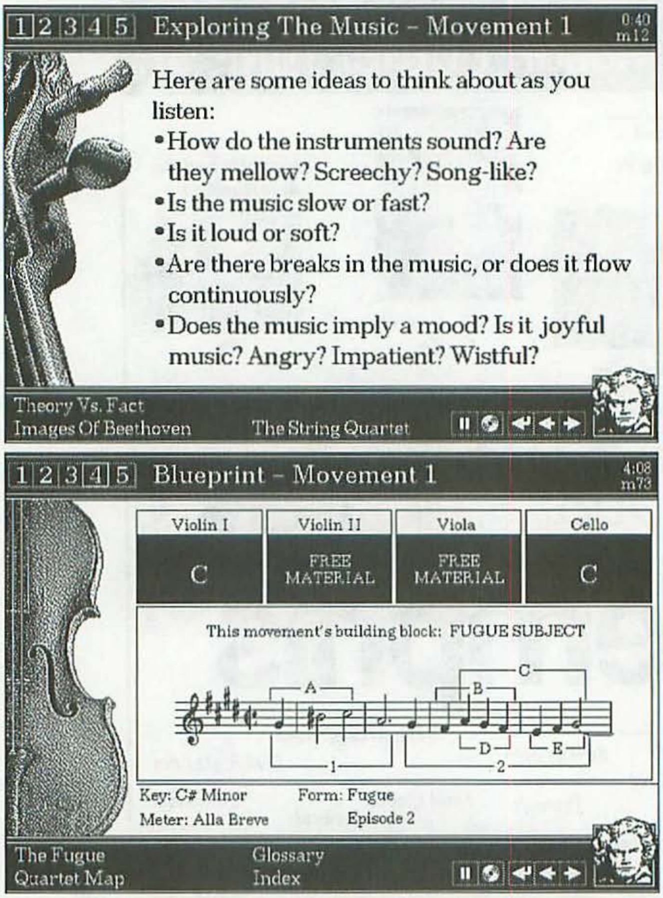
Memphis:
King supports sanitation workers strike

In early March 1968, **James Lawson** , chairman of the **Community on the Move for Equality** , invited King to come to Memphis, Tennessee, to support the black sanitation workers' strike. King arrived March 28, to lead a protest march to city hall. Shortly after the march began, turmoil erupted at the back of the column and the situation deteriorated into a riot. Stores were looted and more than 200 people were arrested. One black youth was killed by police. King was strongly criticized in the newspapers. The Memphis Commercial Appeal accused King of fleeing the melee instead of trying to stop it, that "King's pose as leader of a non-violent movement has been shattered."

Still: Newspaper — "Guardsmen Back Riot Curfew"

File video: King marching with strikers

Figure 21-1: Interactive History Three cards from the HyperCard stack that controls ABC News Interactive's Martin Luther King, Jr. program. Clicking a topic (top) displays a card containing a timeline (middle). Clicking a subject on the timeline displays a card (bottom) with descriptive text and buttons that display accompanying visuals from the videodisc. Another click displays definitions of any terms or biographies of any names that appear in boldface.



1 2 3 4 5 Exploring The Music - Movement 1 0:40 m12

Here are some ideas to think about as you listen:

- How do the instruments sound? Are they mellow? Screechy? Song-like?
- Is the music slow or fast?
- Is it loud or soft?
- Are there breaks in the music, or does it flow continuously?
- Does the music imply a mood? Is it joyful music? Angry? Impatient? Wistful?

Theory Vs. Fact
Images Of Beethoven
The String Quartet

1 2 3 4 5 Blueprint - Movement 1 4:08 m73

Violin I	Violin II	Viola	Cello
C	FREE MATERIAL	FREE MATERIAL	C

This movement's building block: FUGUE SUBJECT

Key: C# Minor
Meter: Alla Breve
Form: Fugue
Episode 2

The Fugue
Quartet Map
Glossary
Index

Figure 21-2: Listen and Learn Warner New Media's The String Quartet lets you listen to a digitally recorded Beethoven string quartet playing on a CD-ROM drive while reading on-screen text in any of several levels, each assuming more musical knowledge than the last. Level 1 (top) is for listeners with little musical knowledge; level 4 (bottom) analyzes the structure of the currently playing segment. In the upper-right corner, a counter displays elapsed time as the music plays.

Optical Data Corporation toolkits

Optical Data Corporation produces packages that teachers can use out-of-the-box or as toolkits for creating their own instructional materials. The Space Disc package, for example, contains videodiscs laden with images of planets taken by the Voyager spacecraft, of North America taken by Landsat satellites, and of space shuttle missions and components. Accompanying stacks let you browse the Voyager images, view Landsat images by clicking on a map, and learn about the space shuttle. You can also create your own stacks that use the videodisc images.

Apple's visual almanac

To give educators a hands-on overview of interactive multimedia's potential — and to allow them to create their own multimedia materials — researchers at Apple's Multimedia Lab spent two years developing a package called The Visual Almanac. It comprises a CD-ROM containing 25MB of HyperCard stacks and digital audio; a workbook; and a videodisc laden with 7,500 sounds and moving and still images — what the workbook not-so-humbly calls "the basic audiovisual vernacular of our culture."

The HyperCard stacks include 14 student activities in science, the arts, social studies, and mathematics. There's also a composition workspace that lets you search for images and sounds based on keywords you type, and then assemble them into stacks. The Visual Almanac was originally available to educators on an award basis only, but now it's available to anyone for only $100 from the Optical Data Corporation (800-524-2481 or 908-668-0022). It's the best introduction you'll find to the educational applications — and implications — of interactive multimedia.

Interacting in other ways

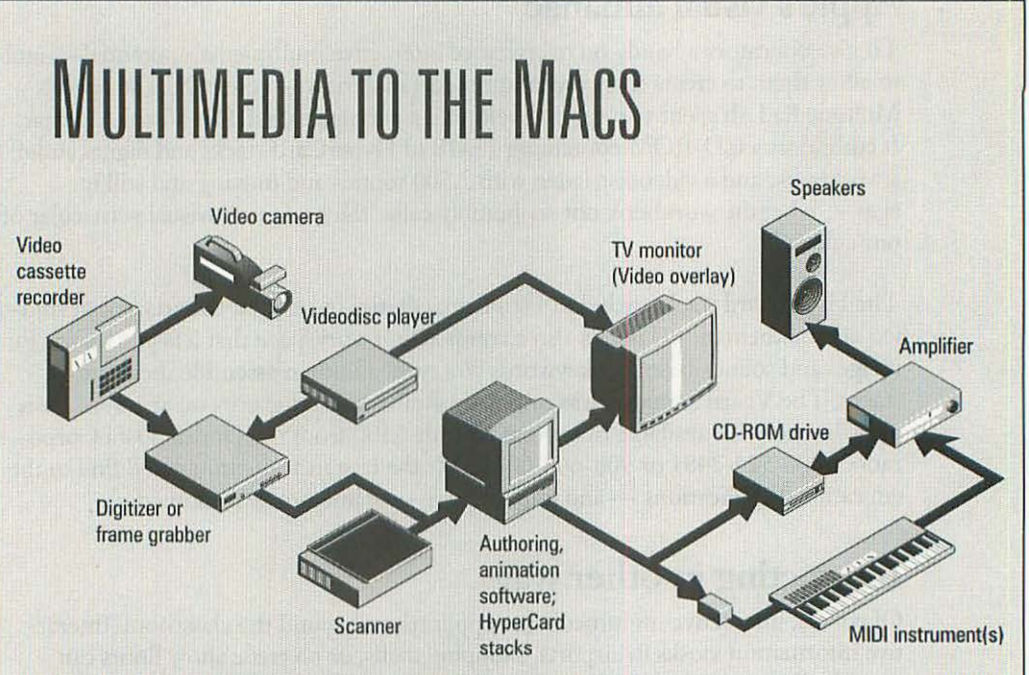
Of course, interactive multimedia has applications beyond the classroom. Interactive information kiosks in airports, shopping malls, or on trade show floors can provide directories and profiles of cities, stores, or exhibitors. Interactive presentations can spotlight a concept, company, or product in a more engaging way. Interactive museum exhibits can enliven potentially dry subjects. In San Francisco's Exploratorium, you can fly over the Bay Area, viewing aerial footage and setting your own course using a trackball.

A Closer Look at the Pieces

I mentioned in passing many of the software and hardware components involved in multimedia. Figure 21-3 "Multimedia to the Macs," illustrates how they interrelate. Here's a closer look at the pieces and a partial list of products from each category.

Authoring software

The key player in multimedia, authoring software, is the stage that lets you direct your production's cast of audio and visual characters. HyperCard is the most popular authoring program; its relatively easy-to-learn programming language, HyperTalk, lets you create simple animations and establish links between on-screen hot spots and other cards.



A complete Macintosh multimedia system might make use of the components shown here: a scanner, video digitizer, and frame grabber for importing images; a CD-ROM drive, MIDI instrument(s), and amplification system for high-quality audio; a videodisc player for showing still and moving images on a television monitor; and a Macintosh running authoring software such as HyperCard.

Figure 21-3: Multimedia to the Macs

Aldus SuperCard is more sophisticated, with better color support and the ability to create stand-alone applications, which you can distribute to people who don't have SuperCard. Spinnaker Software's Plus offers similar features and is also available for DOS PCs. You can move Plus productions between Macs and PCs. A caveat: Color productions can play slowly.

More specialized authoring programs include Macromedia Director and Authorware Professional. Director began life as an animation program, but now has a HyperTalk-like language called Lingo that lets you create interactive animations containing navigation buttons. Director includes a player application that lets others use your productions without having to own Director. Authorware Professional is a high-end authoring package that provides sophisticated animation features and lets you create interactive productions without programming by drawing links between the production's components (see Figure 21-4 "Professional Authoring").

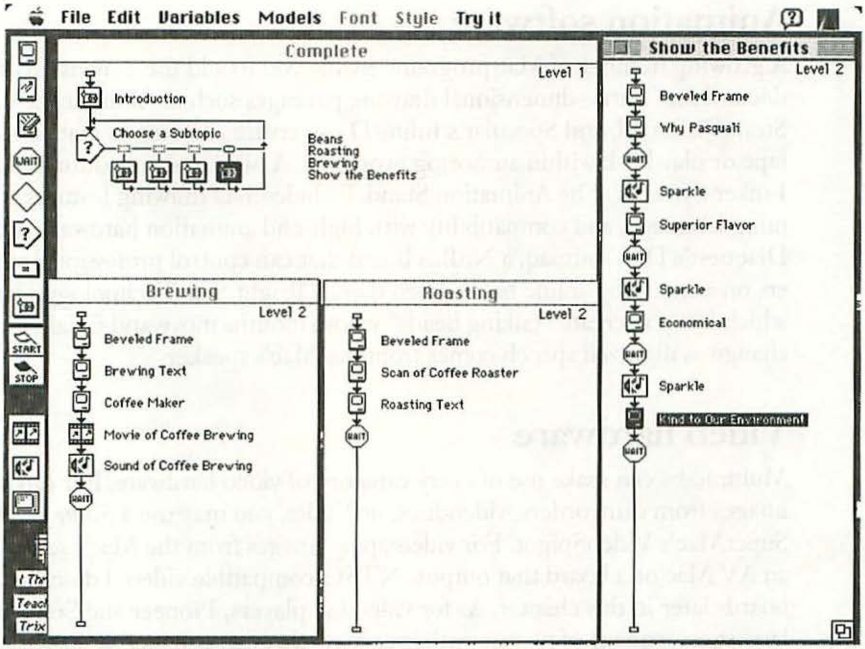


Figure 21-4: Professional Authoring Authorware Professional from Macromedia lets you create production by drawing links between components.

Apple has created some authoring systems that are designed to give you a head start in creating electronic books and other multimedia productions. The Author's Solution for Interactive Electronic Books is designed to support electronic book publishing and is available in two versions. The Level I Kit is a starter product for designing multimedia documents that will be used internally within a school or company.

The Level II Kit, which Apple says can be used to produce professional-quality electronic books within hours, is built on the Voyager Company's Expanded Book Toolkit. The Voyager Company produces the toolkit, which the company uses to create its own titles and books, and also makes it available to other developers. The Expanded Book Toolkit enables authors to produce interactive books with automated word-search and annotation options.

The Apple Multimedia Program (AMP) is an organization for developers of multimedia products and projects. AMP provides members with quarterly mailings, including technical guidebooks, market research reports, substantial discounts on Apple and third-party products, videos on interface design, and the most current information on Apple's directions in multimedia. (For more information, contact Apple at 408-974-4897.)

Animation software

A growing number of Mac programs enable you to add the dimension of motion to documents. Three-dimensional drawing packages such as Aldus Super3D, Strata's StrataVision 3d, and Specular's Infini-D can create animations that you can videotape or play back within authoring programs. A high-end animation program, Linker Systems' The Animation Stand, includes 3-D drawing features, a programming language, and compatibility with high-end animation hardware such as Diaquest's DQ-Animaq, a NuBus board that can control professional video recorders on a frame-by-frame basis. Then there's Bright Star Technology's interFace, which lets you create "talking heads" whose mouths move and facial expressions change as digitized speech comes from the Mac's speaker.

Video hardware

Multimedia can make use of every category of video hardware. For capturing video images from camcorders, videodiscs, or VCRs, you may use a *frame grabber* such as SuperMac's VideoSpigot. For videotaping images from the Mac's screen, you need an AV Mac or a board that outputs NTSC-compatible video. I describe a few such boards later in this chapter. As for videodisc players, Pioneer and Sony make the largest assortment of players with interfaces that can connect to the Mac.

Audio equipment

I've discussed CD-ROM players and entry-level recording hardware such as Macromedia's MacRecorder. To record and play back CD-quality audio, you'll need a board such as Digidesign's Audiomedia II or an AV Mac. Throw in a big, fast hard disk, too, because CD-quality stereo requires 20MB of disk space per minute. If you're playing back audio through the Mac's circuitry, you'll want to connect the Mac to a pair of high-quality speakers such as Bose's VideoRoommates or Apple's own AppleDesign Powered Speakers. (Mac models such as the LC520 include high-fidelity speakers.)

As an alternative, use a MIDI interface to connect your Mac to one or more MIDI synthesizers and play back MIDI sequence files, which use a small fraction of the space. And if you don't want to write or commission original music, Passport Design's Music Data Company sells hundreds of prerecorded MIDI sequences. The next chapter explores digital sound concepts as well as MIDI and MIDI gear.

Focus on Animation

Animation is everywhere — and it has been since newspaper cartoonist Winsor McCay thrilled turn-of-the-century theatergoers with his Gertie the Dinosaur cartoon. So novel were McCay's efforts that audiences "suspected some trick with wires," he later wrote.

Animation has been around on the Mac for most of the machine's lifetime, too. Back in 1985, a small start-up company called MacroMind released a program called VideoWorks. VideoWorks has since evolved into Director, and MacroMind has become Macromedia, one of the multimedia world's top software developers.

Smooth animation requires that the viewer see at least 16 images, or frames, per second. That's easy for any Mac, but creating the frames themselves is, for the most part, your job. Some programs can automatically create certain types of animation, but creating a realistic moving picture still takes time and effort.

Programs such as Macromedia Director and Gold Disk's Animation Works can electronically recreate *cel animation*, the conventional film animation technique patented in 1914 (by another newspaper cartoonist, Earl Hurd) and still used today. With cel animation, a background is drawn or painted on paper, over which are laid transparent sheets of celluloid containing only those components of the frame that have moved since the previous frame. The resulting composite is photographed, a new cel is laid in place, and the process is repeated. Cel animation saves animators time and effort by eliminating the need for them to redraw the background for every frame (as Winsor McCay did for all 10,000 frames of Gertie the Dinosaur).

A closer look at animating in Director

Macromedia Director's animation features are among the best of any authoring program. In Director, the components in an animation — backgrounds, animated objects, sound effects, and so on — are stored in the Cast window. The Cast window is a cinematic database, an electronic casting office that holds the audio and visual cast of characters in an animation. You add a cast member to an animation by dragging it from the Cast window to the stage, or by using the Score window, which graphically depicts the events in the animation (see Figure 21-5 "In the Director's Chair").

Automated features

If all this sounds complex, it can be. Fortunately, Director provides a host of labor-saving features for creating animated titles, bar charts, bullet charts, and other special effects (see Figure 21-6 "Automatic Animation"). Director's Overview utility lets you streamline the process of creating animated presentations by enabling you to easily combine still graphics, animations, and sounds (see Figure 21-7 "An Overview of Animation").

What happens between the frames

Director also offers the computer animator's best friend, an in-betweening, or *tweening*, feature. Tweening lets you animate without crafting every frame by hand. You create the first and last frames (the *key frames)* of a sequence, specifying the

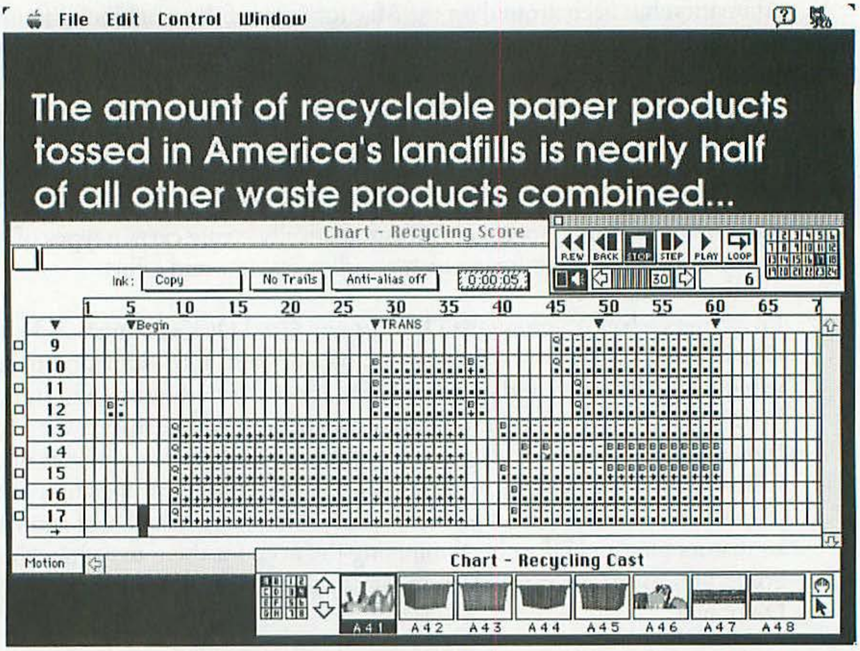
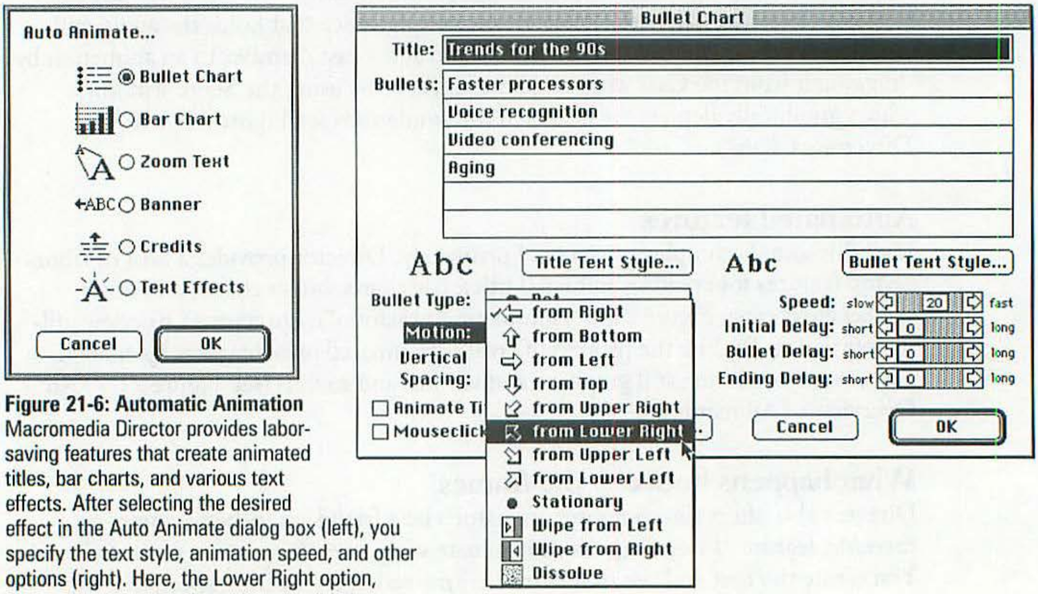


Figure 21-5: In the Director's Chair Macromedia Director stores the components of an animated sequence — objects, sounds, backgrounds, and so on — in the Cast window (bottom right). Behind the Cast window is the Score window, which graphically depicts the events in the sequence. Behind the Score window is the Stage, where the animation takes place.



● Bullet Chart

Title: Trends for the 90s

Bullets: Faster processors
Voice recognition
Video conferencing
Aging

Motion: from Lower Right

Speed: 20

Initial Delay: 0

Bullet Delay: 0

Ending Delay: 0

Figure 21-6: Automatic Animation Macromedia Director provides labor-saving features that create animated titles, bar charts, and various text effects. After selecting the desired effect in the Auto Animate dialog box (left), you specify the text style, animation speed, and other options (right). Here, the Lower Right option, which causes each bulleted item to slide into place from the lower right edge of the screen, is selected.

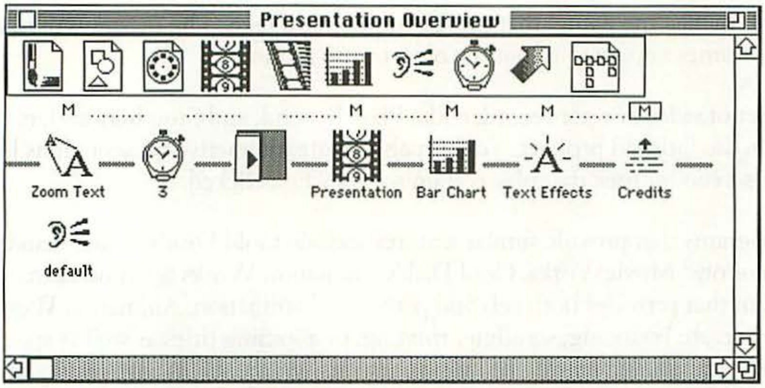


Figure 21-7: An Overview of Animation Director's Overview window lets you quickly create and reorganize productions by dragging icons and choosing files. This example production begins with a title that zooms to fill the screen. After a three-second pause, a visual transition leads to a Director animation, which is followed by a bar chart created in Director. Finally, a sparkling title appears followed by a list of credits.

beginning and ending appearance of an object, as well as the total number of frames desired for the sequence. Director does the rest, creating the specified number of frames and moving the object from one frame to the next.

Printing and filming animations

Director can also print the frames in an animation. You can film an animation by printing one frame on each page, and then punching the pages with a three-hole paper punch. Next, mount a movie camera on a tripod and point it at a copy stand containing pins that hold the pages in register. Insert each page into the stand, snap a frame, and repeat the process.

Animation alternatives

Director has some of the best animation features around, but it doesn't have a monopoly on motion. You can find more basic animation features in Macromedia's Action. Action is designed to be a step up from slide-oriented presentation programs such as Aldus Persuasion and Microsoft PowerPoint.

In Action, a presentation consists not of slides, but of *scenes.* Each scene can hold graphics in all popular formats as well as sounds that can play consecutively or simultaneously. The cast members in each scene are superimposed over a background called a *stage.*

Action provides numerous flashy transition effects as well as *path-based* animation. With the latter, you create animated sequences by drawing lines that describe the path (hence the name) that moving objects will take. The program then generates the frames necessary to put the objects into motion.

A set of videocassette recorder-like Play, Rewind, and Stop buttons lets you navigate the finished product. You can also create interactive presentations by creating on-screen buttons that play certain scenes when clicked.

Programs that provide similar features include Gold Disk's Astound and Interactive Solutions' MovieWorks. Gold Disk's Animation Works is a more advanced program that provides both cel- and path-based animation. Animation Works also lets you create bouncing, scrolling, rotating, or zooming titles as well as special effects such as animated mattes, professional wipes, gradient fills, and gravity simulation.

QuickTime Defined

The Mac was the first affordable computer that made it easy to combine text and graphics in the same document. Apple's QuickTime software extends this innovation to include dynamic, time-based data — animation, video clips, and sound. (Still images and text are static data — you can't play a scanned image or a paragraph of text.)

QuickTime isn't an application program that you double-click and run; it's an extension to the Mac's system software that application programs can tap into in order to enable you to cut, copy, paste, record, and play dynamic data, which in QuickTime's world are called *movies.* QuickTime teaches the Mac how to move.

In Apple's words, QuickTime provides people with "powerful new tools for communication more closely approximating the richness of the world in which we live." I may not be that effusive about QuickTime, but there's no denying that it is a genuine innovation, and it is a preview of the way we'll use computers in the future. At the very least, it's a fun way to make the Mac's screen come to life.

Ways to Use QuickTime

As with any medium, QuickTime's effectiveness depends on how it's used. Before looking at the technicalities behind QuickTime, I'll spotlight some application scenarios.

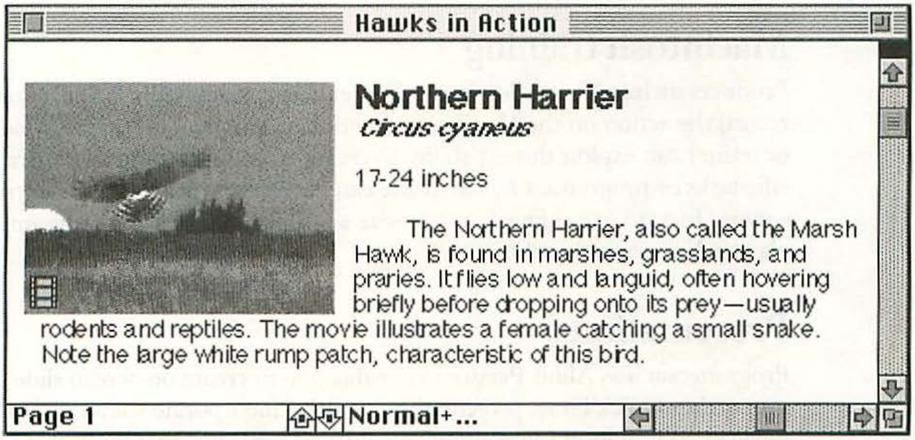
Dynamic documents

Today's most popular word processors, database programs, and integrated packages enable you to incorporate QuickTime movies in your documents (see Figure 21-8 "Moving Documents"). Because QuickTime movies use so much disk space and because most documents are ultimately printed, however, I'm a bit skeptical of this aspect of QuickTime. Perhaps the era of dynamic documents will dawn along with the arrival of the "Paperless Office"— next year, or the year after, or maybe the year after that.

Electronic publishing

Imagine an electronic version of your favorite magazine: You not only read its text, you double-click illustrations and watch them come to life. Double-click a photo in a movie review to see a preview, a music-note icon to hear a snippet of a new hit song, a photo in an interview to see the actual interview, or a stock market graph to see the trends animated. This brave new world is here now: A multimedia, CD-ROM-based magazine called *Nautilus* delivers hundreds of megabytes of QuickTime movies, audio, and software (freeware, shareware, and commercial demonstrations) in each issue. You can even read (as well as watch and listen to) an interactive version of *Macworld* called *Macworld Interactive*, produced by Sumeria.

Macworld CD Ventures publishes CD-ROMs containing similar content. With Macworld CD Ventures' Taste Mate video selection system, for example, you fill out an on-screen questionnaire and the system recommends movies it thinks you'd like.



Northern Harrier

Circus cyaneus

17-24 inches

The Northern Harrier, also called the Marsh Hawk, is found in marshes, grasslands, and praries. It flies low and languid, often hovering briefly before dropping onto its prey—usually rodents and reptiles. The movie illustrates a female catching a small snake. Note the large white rump patch, characteristic of this bird.

Figure 21-8: Moving Documents You can add QuickTime movies to documents created in most word processors, including Microsoft Word 5. The small movie icon in the movie's lower-left corner is called a *badge,* and distinguishes the movie from a still graphic. The badge disappears when a movie is playing.

Education

Educational software such as Knowledge Revolution's Interactive Physics uses animated sequences to illustrate scientific concepts. History software can show clips of historic events and speeches. Some such products were available long before QuickTime's debut: The ABC News Interactive series, discussed earlier in this chapter, are the best known. But these packages require bulky laserdisc players to store their video and sound. With QuickTime, the video and sound clips can be stored along with navigational software itself, usually HyperCard, on a hard disk or CD-ROM disc.

TV and film production

Broadcasting and film professionals can use QuickTime to create animated storyboards that show camera angles and scene progressions, and to create mock-ups of animations that will be produced using high-end broadcasting equipment. Some broadcasters are also using QuickTime to create electronic catalogs of their vast film and videotape libraries.

Entertainment

QuickTime is nothing if not fun. In the Voyager Company's Baseball's Greatest Hits, you use a HyperCard stack to explore hours of sound and video clips of baseball's greats. It's also easy to digitize snippets of home videos, and it's fun to play director and piece them together into your own productions. I guarantee that you won't bore friends and neighbors: QuickTime movies use so much disk space that most of your productions will be over within minutes if not seconds.

Macintosh training

Products such as Vision Software's CameraMan and Baseline's Spectator let you record the action on the Mac's screen and then save it as a movie. A Mac consultant or trainer can exploit this capability to create customized training software for specific tasks or programs. Or, the movie can be part of a program's on-screen help system. Instead of reading how to resize an object in a drawing program, you can play back a movie that shows you.

Presentations

Programs such as Aldus Persuasion enable you to create on-screen slide shows. By supporting QuickTime, presentations can also incorporate sound and motion. A medical presentation can contain an animated sequence that illustrates a new discovery. An architect's presentation can include an animated walk-through that takes clients on a tour of an unbuilt building. An attorney's presentation can include video clips of the scene of a crime. A trade show information kiosk can incorporate movies promoting products or exhibitors.

Science and engineering

Time-based data doesn't have to be video clips or sounds. The data transmitted by seismic equipment is dynamic; a QuickTime movie can record this data so that seismologists can play it back at various speeds to study a quake and its aftershocks. Similarly, meteorologists can record data from weather instruments or photos from weather satellites for later analysis or animation. Scientific programs such as Mathematica can create animated sequences from data you supply.

As these examples show, you can approach QuickTime from two perspectives — as a viewer who primarily works with commercially produced education or entertainment software, or as a producer who creates his or her own QuickTime movies. The path you choose (and you may tread both) will influence your shopping list.

Required Equipment

To use QuickTime, you need a color Mac with a hard disk running System 6.0.7 or later. The 8-bit (256-color) video hardware built into most color Macs will do, but for the best image quality, you'll want video circuitry that can display thousands or millions of colors — 16- or 24-bit video (see Chapter 31). QuickTime also runs on the PowerBook 140 and 170, but color movies are little more than recognizable on their monochrome screens.

Memory is a must

As for RAM, 4MB is a reasonable minimum, but 8MB or more delivers better performance when recording and saving movies. And don't expect any help from virtual memory, that System 7 feature that lets the Mac treat part of a hard disk as RAM. QuickTime movies may play back poorly when virtual memory is on, and you can encounter disconcerting delays when recording.

QuickTime starter

You also need the QuickTime extension itself, which is available free through user groups and on-line services and is generally included with QuickTime-oriented software. You may want to buy Apple's QuickTime Starter Kit, which includes extra utilities and a CD-ROM disc packed with video clips you can use in your own productions.

CD-ROM drives — those data-oriented cousins to compact disc players — aren't required for multimedia or QuickTime work, but you'll probably want one. Most commercial QuickTime-based software is distributed on CD-ROM. One of my favorite examples is The Voyager Company's Baseball's Greatest Hits, in which you use a HyperCard stack to explore hours of sound and video clips of baseball's greats (see Figure 21-9 "QuickTime for Baseball").

Several companies, including Macromedia, Alpha Technologies, and CD Technology, also offer CD-ROM libraries of canned video clips, sound effects, and animations. (Beware: Some clip CD-ROMs are candidates for "America's Hoaky Home Videos." Try a few before buying — or make sure the company has a money-back guarantee.) With street and mail-order prices falling below $500, CD-ROM drives are becoming mainstream add-ons. A growing number of Mac models even include them.

Some QuickTime-oriented programs also come with clip discs. Motion Works' ProMotion animation package includes a collection of animations called

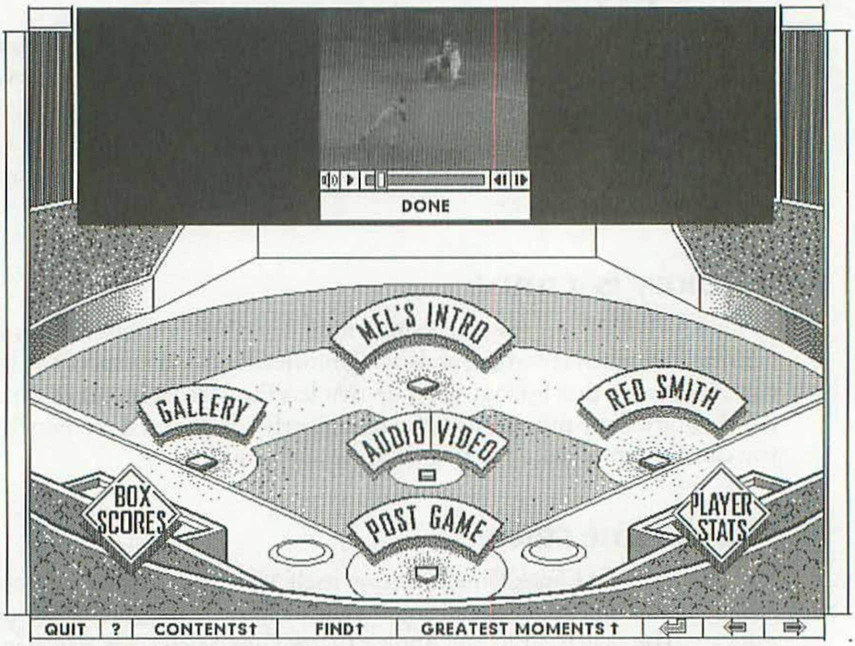


Figure 21-9: QuickTime for Baseball Hank Aaron connects for home run 715 in The Voyager Company's Baseball's Greatest Hits. This CD-ROM is packed with movies, still images, and sounds of baseball lore, hosted by Mel Allen. Many columns by legendary sportswriter Red Smith are also included, as are recorded interviews with numerous hall of famers. The controls that appear at the bottom of the movie let you pause, adjust sound volume, and step forward or back in the movie. All programs that have QuickTime support use these standard controls.

PrimeTime (which is also sold separately), and DiVA's VideoShop includes The Image Bank's Footage, Volume 1 — the best of the clip collections I've seen.

Can Your Mac Handle Dynamic Data?

Because QuickTime performs its playback magic with no additional hardware, your Mac's processor can do all the work. As a result, your machine's speed determines how many video frames QuickTime is able to display per second. A slow color Mac such as an LC or original II can show about 10 frames per second (fps) — a rather slow frame rate that gives movies a jittery, Keystone Cops flavor. A mid-range Mac can play about 15 fps, just shy of the frame rate used by Super 8 movies (remember them?), and a Quadra can approach 30 fps — the television industry standard in the United States. Regardless of the playback frame rate, QuickTime usually manages to keep the sound and video synchronized, thus conquering one of the problems that has traditionally plagued multimedia producers.

Frame rate frustrations

Before you buy an accelerator board to boost the frame rate of a sluggish color Mac, note that some accelerators are incompatible with the sound track of QuickTime movies. You may speed your frame rates by installing a board such as the Radius Rocket, but you'll end up with fuzzy, distorted sound or no sound at all.

Not only are QuickTime frame rates on the slow side, but the size of a QuickTime movie isn't exactly Panavision. A QuickTime movie normally plays in a window that measures 320 by 240 pixels — smaller than an index card. You can resize a movie to fill more of the screen, but frame rates slow dramatically and image quality suffers.

Slow frame rates and tiny movies aren't flaws in QuickTime, but limitations of current Macs. As the Mac family gets faster, these drawbacks will vanish.

Modular movies

Moreover, QuickTime doesn't necessarily have to rely on the Mac's processor for everything. QuickTime is designed in a modular way that enables it to take advantage of specialized coprocessor hardware designed for the demands of digital video and audio. With NuBus boards such as New Video's EyeQ, SuperMac's Digital Film, or Radius' VideoVision, you can record and play back full-screen — 640 by 480 pixels — movies at 30 fps. Some boards also handle CD-quality stereo recording and playback. And because they plug into QuickTime, they're compatible with any application program that supports QuickTime.

QuickTime's modular design is one of its best attributes. It's what enables you to create movies on one machine and play them back on others — even ones with different performance and video capabilities. QuickTime's extensibility has other benefits I'll describe shortly.

Making Your Own Movies

To many people, making QuickTime movies means digitizing video from a camcorder or videocassette recorder. As mentioned earlier, this means buying a video-capture board, which accepts an analog video signal and translates it into digital data. If you have an AV Mac such as a Centris 660AV or Quadra 840AV, you can simply attach a video source to the Mac's Video In connector.

Editing video segments

Most major video board manufacturers offer video capture boards; the most popular is SuperMac's VideoSpigot series. All VideoSpigots include a program, called ScreenPlay, that lets you view live video on the screen, record clips, and edit them by changing their beginning and end points.

QUICK TIPS

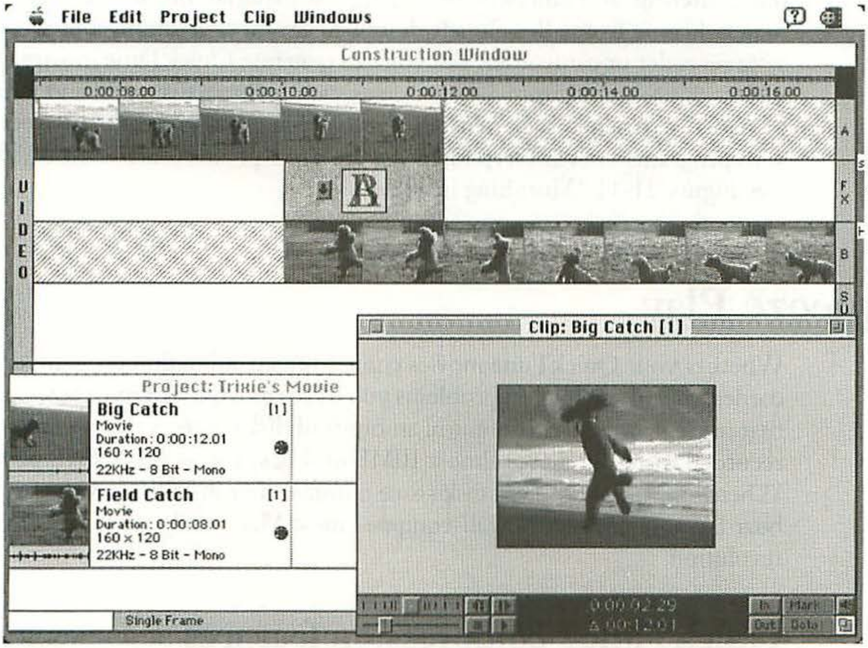
QuickTime on a Shoestring

If you have a color Mac with enough memory and hard disk space, you can try out QuickTime with little investment using the software listed here, which is available — along with hundreds of QuickTime movies — through user groups and on-line services.

- ❖ *QuickTime Extras* This disk from Apple contains the QuickTime extension itself as well as an extension called Wild Magic, which lets you use movies in almost any program that supports PICT images. A program that plays movies is also included, as are some tiny sample movies.
- ❖ *Popcorn* This free program from Aladdin Systems lets you play movies as well as cut, copy, and paste portions of them. It's an easy way to test the waters of digital video editing.
- ❖ *HyperMovie Player* This $5 shareware HyperCard stack by Kevin Harris plays movies. It's included on the Macworld Complete Mac CD that accompanies this book. (HyperCard includes a set of HyperCard XCMDs that let you add movie-playback features to your own stacks.)
- ❖ *Movies in the Dark* This free module by Maurice Volaski lets Berkeley Systems' After Dark screen saver play QuickTime movies.

For serious video editing, though, you'll want a program such as Adobe Premiere, which lets you assemble movies, edit them, add sound tracks, and specify transitions such as dissolves and fades (see Figure 21-10 "Now Premiering").

The editing window in Premiere graphically illustrates how a QuickTime movie consists of *tracks*, usually a video track and a sound track. Future enhancements to QuickTime will support additional types of tracks, such as MIDI data that will enable a movie to control music synthesizers as it plays. When these enhancements become available, you'll install them by simply dragging files into your System Folder. The new features will immediately be available to QuickTime-savvy programs: You won't need to upgrade your application software. There's another benefit of QuickTime's expandability.



Project: Trixie's Movie

Big Catch [1]
Movie
Duration: 0:00:12.01
160 × 120
22KHz - 8 Bit - Mono

Field Catch [1]
Movie
Duration: 0:00:08.01
160 × 120
22KHz - 8 Bit - Mono

Figure 21-10: Now Premiering Adobe Premiere lets you assemble QuickTime movies into larger movies, called *projects,* complete with special visual effects. At the lower left, the project window lists available movies along with their characteristics. You include a movie in a project by dragging it from the project window to the construction window (top). The construction window has an adjustable time ruler that shows the project's length. This construction window shows a two-second dissolve between two movies — one movie fades out as the second fades in. Creating such an effect involves simply dragging two movies into position and then dragging the desired effect from Premiere's effects window (not shown). The clip window (lower right) lets you view and modify individual movies. When you've finished with a project, you can create a movie of its contents by choosing the Make Movie command.

Premiere also provides filters that alter the appearance of clips — for example, you can distort a scene to look like it was reflected in a glass globe. If you've used Adobe Photoshop, Premiere's filters will be familiar; indeed, Premiere can use Photoshop filters.

Another powerful video-editing program is DiVA's VideoShop, which provides more features than Premiere for managing and arranging QuickTime movies. For example, the program provides a Finder-like desktop that lets you preview movies without having to open them.

Generating your own video

Video editing programs such as Premiere and VideoShop are to QuickTime what a program like Adobe Photoshop is to image processing — tools for editing, assembling, altering, and otherwise massaging raw material. But where does the raw material come from? I've already described the most common source — a videocassette recorder or camcorder. But you can generate QuickTime movies with a wide variety of programs, from 3-D packages such as StrataVision 3d and Pixar Typistry to statistics packages such as Mathematica. You can also create nifty special effects with programs such as Gryphon Software's Morph and VideoLake's VideoFusion (see Figure 21-11 "Morphing in Movies").

Squeeze Play

Whether your QuickTime movies come from an animation program or a camcorder, one of the biggest problems you'll face as a QuickTime movie producer is that movies can use astronomical amounts of disk space. A five-second movie recorded with sound uses almost 10MB of disk space — that's 2MB per second. When you run out of hard disk space minutes after installing a video-capture board, you realize just how ill-equipped most Macs really are for the digital video revolution.

QuickTime's compression features

Fortunately, you can dramatically reduce disk space requirements by taking advantage of QuickTime's compression features. If you've used programs such as Aladdin's StuffIt, you know that a file can be compressed to use less disk space, and then decompressed when you want to use it. QuickTime's compression and decompression features are similar, but much more sophisticated. For example, QuickTime decompresses movie frames on the fly as a movie plays. That QuickTime can decompress and display 10 to 30 color images per second with no additional hardware is remarkable, and a testament to the talent of QuickTime's programmers.

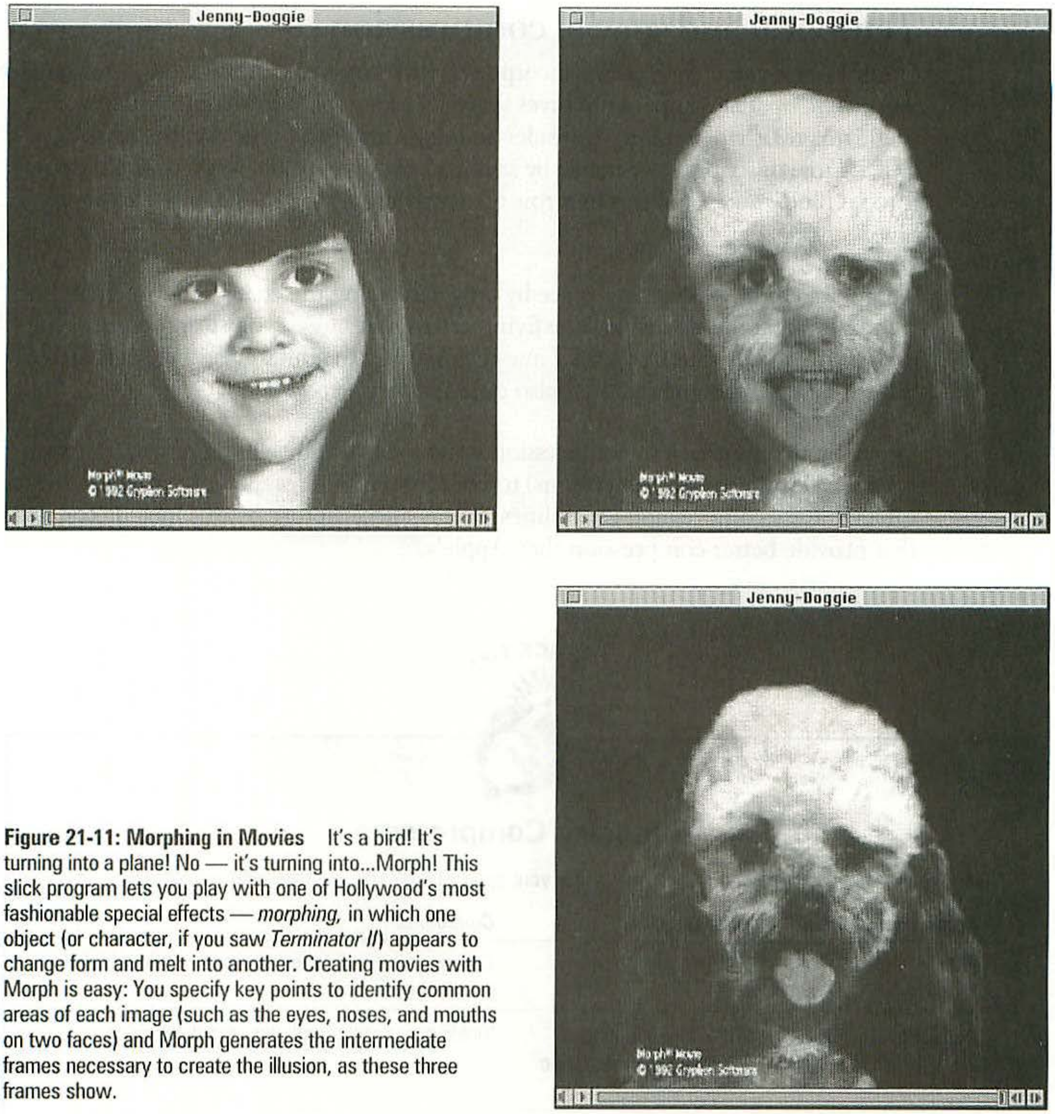


Figure 21-11: Morphing in Movies It's a bird! It's turning into a plane! No — it's turning into...Morph! This slick program lets you play with one of Hollywood's most fashionable special effects — *morphing,* in which one object (or character, if you saw *Terminator II*) appears to change form and melt into another. Creating movies with Morph is easy: You specify key points to identify common areas of each image (such as the eyes, noses, and mouths on two faces) and Morph generates the intermediate frames necessary to create the illusion, as these three frames show.

QuickTime includes several compressors, each of which provides a different degree of space savings and image quality (see the Quick Tips box "Choosing Compressors"). Compression often means trading image quality for disk space, but it's a worthwhile trade-off, especially because the results are still more than adequate for most applications. By using the video compressor at its lowest-quality setting, QuickTime can squeeze that same five-second, 10MB movie down to 722K —almost a fifteen-fold savings. Compression can also allow for faster playback frame rates on slower Macs.

Temporal and spacial compression

QuickTime's video compressor incorporates two kinds of compression — *temporal* and *spatial.* Spatial compression saves space by removing information within a single image or video frame. Consider an image that's half blue sky: Instead of QuickTime describing the image by saying, "row one is blue, row two is blue, row three is blue," and so on through row 60, it can simply say: "The first 60 rows are blue."

Temporal compression saves space by only describing the changes between frames. For example, if there's an airplane flying across that blue sky, instead of describing each frame in its entirety, QuickTime records only the differences between each frame. Temporal compression is also called *frame differencing.*

QuickTime's approach to compression is modular too. By adding new *codecs* (compression/decompression extensions) to your System Folder, you can enhance QuickTime's compression capabilities. Some video-capture boards include codecs that provide better compression than Apple's.

QUICK TIPS

Choosing Compressors

Which compression scheme should you choose for your applications? Use the following as a guide.

Compressor Name	***Best Used for***	***Comments***
Photo	Still images	Compression and decompression require at least several seconds
Animation	Animated sequences, including recorded Mac screen activity	Yields poor results with digitized color video
Video	Digitized video	Very fast decompression
Graphics	8-bit (256-color) still images and movies	Provides better compression but slower playback speeds than the animation compressor
Compact Video	Digitized video	Available in QuickTime 1.5 and later versions

Recording Your Efforts on Videotape

It's fun to show QuickTime movies on the Mac's screen, but if you want to distribute your productions, you'll probably want to record them on videotape. Creating professional-quality video is a subject for an entire book. What follows is an introduction to the challenges of recording to video as well as some product information to get you started.

Bridging the Mac-to-broadcast-video gap

At the simplest level, uniting a Mac and video recorder means routing the Mac's video output signal to the video recorder's video-input connector. But you also need to be sure that the Mac is sending a signal that the video recorder can understand. And that's when the differences between Macintosh video and broadcast video become critical.

The first of these differences concerns those horizontal scan lines that form video images. On all video tubes, these lines are formed by an electron gun (or, with most color monitors, three electron guns) within the video tube. The gun fires a stream of electrons at the tube's inner surface, causing its phosphor coating to glow briefly.

On a 14-inch color monitor, there are 480 horizontal scan lines, and they're painted one at a time, from left to right, from the top of the screen to the bottom. One complete set of scan lines forms a frame. Most Mac video boards repaint the entire frame roughly 60 to 70 times per second, which translates into a frame rate of 60 to 70Hz.

QUICK TIPS

Converting PICS files to QuickTime Movies

Many animation-oriented programs work with a type of file called *PICS* (PICture Sequence), which contains the series of frames that comprise an animation. You can convert PICS files to QuickTime movies by using Apple's Movie Converter utility, included in the QuickTime Starter Kit. This utility also converts other types of files — including ones created on the IBM PC — into movies.

Interlaced and noninterlaced video

By contrast, American television uses 512 horizontal scan lines, painted in a very different manner. Instead of painting one frame's worth of scan lines from top to bottom, a TV set paints them in two separate passes, or *fields*. First, all the odd-

QUICK TIPS

Designing for Television

Television graphic design has its own unique requirements. Because of television's limited resolution, images and text tend to have a soft, diffused appearance. This and the fact that a TV image is interlaced require some special approaches to graphic design.

Avoid thin lines

Lines that are one scan line wide will flicker badly, and even lines that are two scan lines wide tend to break up. Use horizontal lines that are an even number of pixels (2, 4, 6, and 8) high.

Avoid tight spacing

Tightly spaced parallel lines, small boxes, and tight concentric circles are all prone to flicker because they conflict with the TV's scan lines. Make them heavier and space them farther apart than you might for a printed graphic. Think of the stock market graphs you see on the news: They're often superimposed over a grid, but the grid boxes are large. Use a minimum box size of 1 square inch, as seen on a 19-inch television.

Avoid lightweight fonts

Fonts such as Helvetica Light or Univers 45 and serif typefaces in small sizes are risky because they tend to become blurred and hard to see. Bodoni, for example, doesn't work well in small sizes because the serifs and thin portions of characters are too thin. Times and Caslon don't always work well, either. Century Schoolbook is better, because its thins aren't very thin.

Don't space characters too tightly

Avoid excessively close kerning. The edges of characters bloom when televised, so the characters appear closer together than they really are. To compensate, space characters so that they look a bit too loose on the Mac's monitor.

Choose colors carefully

As a general rule, combine colors that are very different, like a light blue and a dark red, not a medium red and a medium blue. Use a full range of pastel colors, and they all may end up looking the same. Also, avoid colors that are too hot, like hot pink or lemon yellow. If you want yellow, use a more golden yellow. If a color is too hot, it can bleed past its borders or appear to vibrate.

Standalone titles

For titles that will not be superimposed over an image, use a black background and white or colored text. Black or colored text on a white background is rarely used in television for the same reason that it's rarely used in presentation graphics: An all-white background tends to be too glaring and harsh.

Superimposed titles

For titles that will be superimposed over an image, keep the text simple. Use a font such as Univers 65 or Helvetica Medium and choose a color that will enable the text to be visible over the background. Don't use white text, for example, if the background is a snow-covered ski slope.

numbered lines are scanned, and then all the even-numbered lines are scanned. Each field is painted 30 times per second, giving broadcast video a frame rate of 30Hz. Thanks to persistence of vision — the same phenomenon that makes movies appear to move — we see the two fields as one image. This two-fields-per-frame approach is called *interlaced video.* The Mac's approach of painting all the scan lines in one pass is called *noninterlaced* video.

Color and Size Differences

Mac video and TV also handle color differently. In the Mac, the signals for red, green, and blue — the primary additive colors from which all colors are created — each travel on a separate wire. Other wires carry synchronization, or *sync,* signals. This approach is called *RGB video.*

In the TV world, the red, green, and blue signals are merged with the sync signals into a *composite* signal that's technically simpler but lacks the sharpness and clarity of RGB video. The rules that describe the format of a composite broadcast video signal were developed about 30 years ago by the National Television System Committee, or NTSC. Broadcast video is often referred to as NTSC video, or by the name of the standard itself, RS170.

The technicalities don't stop there. Because of a television industry practice called *overscan,* in which the image projected onto a television's video tube is larger than will fit, the outer edges of the Mac's screen won't appear on the television or videotape.

Overscan was born in television's early days, when the image on a picture tube would gradually shrink as the tube aged. Today's picture tubes don't suffer from this flaw, but overscan remains, partly to accommodate the elderly televisions still among us and partly because television manufacturers would rather fill an entire screen than have a black border around its image. On the other hand, computer monitors *underscan* — they project an image smaller than the tube's surface in order to show every precious pixel.

Because of overscan, it's best to design titles and other graphics to occupy the center of the Mac's display — although you still may need to adjust the position of the text after you've connected the Mac to your video gear.

So in many ways, an NTSC signal is technically inferior to a color Mac's video signal. That's to be expected, given the less-demanding nature of television: A TV image doesn't have to be sharp enough to display small text that's legible at arm's length. In short, to record to video from the Mac, you need to tell the Mac to lower its standards.

Cheap Ways to Record Video

If you want to experiment with putting the Mac's screen on videotape, but you don't want to invest in an NTSC board, the following sections are for you.

The Mac II Video Utility

If you have the original Macintosh II Video Card — the first NuBus color video card Apple released for the Mac — look in a user group library or on-line service for a copy of a free utility called the Apple Macintosh II Video Utility. The utility lets you attach a standard Macintosh II Video Card directly to a video recorder using a simple cable, which you can make yourself or have a TV technician make for you. The results aren't 100 percent broadcast quality, as they say in TV, but they're not bad. Alas, the utility doesn't work with the built-in video circuitry that most Macs provide, nor does it work with Apple's Macintosh Display Card 4•8, 8•24, and 8•24GC boards.

The Apple video utility relies on the Macintosh II Video Card's ability to be reprogrammed to put out a different kind of video signal. The utility is an extension that reprograms the video board to output a signal that's very close to the NTSC standard. The utility supports each of the Mac II Video Card's modes (2, 4, 16, or 256 gray shades or colors), but in black and white only. So, you can record gray-scale images or use the fade-in and -out effects of programs like Macromedia Director, but you can't record in color. The utility even provides filtering options that eliminate flickering caused by thin lines. The utility comes with directions that also show you how to wire the cable (see Figure 21-12 "Making the Connection").

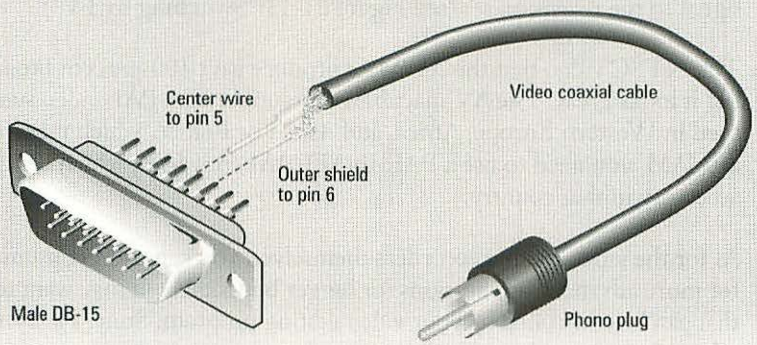
The VideoSync utility

Apple's VideoSync utility is designed to let you videotape directly from the Mac's screen without having a distracting horizontal line appear every second or two. The utility adds an option to the Monitors control panel that lets you adjust the timing of an Apple video card. The resulting Macintosh monitor image appears stable when photographed by an NTSC video camera.

VideoSync requires System 6.0.4 or later; an AppleColor High-Resolution RGB Monitor; and a Macintosh Display Card 4•8, 8•24, 8•24 GC, Apple High Resolution Video Card, or Macintosh II Video Card. The utility is also compatible with some third-party displays that support Apple video cards. The utility doesn't work with the built-in video circuitry most Macs provide.

The VideoSync utility is available for $35 from APDA, Apple's source for developer tools. If you're interested in obtaining a copy of VideoSync and its documentation, contact APDA in the United States at 800-282-2732.

MAKING THE CONNECTION



To attach the Macintosh II Video Card to a video recorder, construct a cable as shown here. The Macintosh end of the cable requires a male DB-15 connector. Many video recorders use a female RCA phono plug for their video inputs; in such cases, the recorder end of the cable should use a male RCA phono plug. You can use a shielded audio cable as a starting point for your cable, cutting the plug from one end and attaching the wires to the DB-15. The center wire of the cable attaches to pin 5, while the outer shield wire attaches to pin 6. Caution: You can damage your Macintosh and your video equipment by constructing the cable improperly. Consider having a video technician construct the cable for you.

Figure 21-12: Making the Connection

Video Output Hardware

With hardware add-ons such as Radius' Digital Media Studio and VideoVision system, RasterOps' MediaTime and MoviePak system, and SuperMac's Digital Film, you can capture full-frame (not Saltine-size) QuickTime movies and record full-frame video on videocassette recorders.

Recording Video from an AV Mac

If you have an AV Mac such as a Centris 660AV or Quadra 840AV, you don't need any additional hardware to record full-frame video (except for a video recorder, of course).

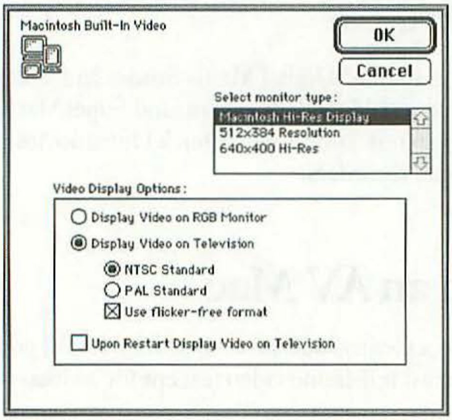
Among the many ports on the back of an AV Mac is a Video Out jack that you can connect to the Video In connector on a videocassette recorder or camcorder. After making the connection, use the Monitors control panel to route the Mac's video signal to the television set (see Figure 21-13 "Switching to TV").

The NTSC video that the AV Macs produce isn't 100-percent broadcast quality, but it looks great. The AV machines also support the PAL video standard that's used in Western Europe, Africa, and Asia. For France, which uses a standard called SECAM, you need to use a PAL-to-SECAM converter, which is a common video accessory in that country.

As for the videocassette recorders themselves, you can use a consumer VCR, but for more advanced applications (or bigger budgets), you may want to use a machine that can be controlled by your video editing program. Sony, Panasonic, NEC, and other big-name video manufacturers offer such machines.

The Sony Vbox controller, for example, is a video/computer interface that lets you control a wide range of Sony consumer video gear, including VCRs and 8mm camcorders, from within popular presentation and multimedia applications. With the Sony Vbox interface, the Mac can accurately control multiple video devices. Sony Vbox interface also lets you search for and identify specific video segments to be incorporated into a production.

The Sony Vbox uses Sony's Video System Control Architecture (VISCA) protocol, designed by Sony as a standard set of command codes for synchronized computer control of multiple video peripherals. With the Vbox interface and a video production program that supports VISCA, your Mac can control a VISCA-supported video recorder such as Sony's Vdeck.



Macintosh Built-In Video

Select monitor type:
Macintosh Hi-Res Display
512x384 Resolution
640x400 Hi-Res

Video Display Options:
○ Display Video on RGB Monitor
● Display Video on Television
● NTSC Standard
○ PAL Standard
☒ Use flicker-free format
☐ Upon Restart Display Video on Television

Figure 21-13: Switching to TV The Monitors control panel on an AV Mac provides additional options that let you route the video signal to a television or videorecorder. To switch to TV, click the Monitors control panel's Options button (not shown here) and then select the NTSC or PAL option as needed. If you want the entire Mac screen to fit in the video image, select the 512x384 option in the Select monitor type box. You may also want to check the Use flicker-free format box to avoid jittery horizontal lines.

Another plus to using a computer-controllable video deck is that you can get higher-quality results when digitizing movies by doing so on a frame-by-frame basis — a technique sometimes called controlled capture. (The opposite of controlled capture is live capture — digitizing movies in real time, as a videotape plays back or as you simply point a camcorder at the subject.)

You probably won't be shocked to hear that professional and semiprofessional video gear is costly. But just as graphics service bureaus enable you to output text and graphics to a high-resolution imagesetter, video service bureaus are appearing that enable you to rent time on high-end video production equipment. You create your rough edit using a program such as Premiere or VideoShop, and then export an *edit-decision list* (EDL) — a list of all the clips, transitions, and special effects in the production. You can then supply your original videotapes and the EDL to the service bureau, which will return them along with a master of your final, edited production.

Assessing the Impact of Multimedia

It's obvious that going for broke in multimedia can mean going broke. Indeed, until the prices of its various pieces come down — or until a new generation of televisions is introduced that incorporate some of the pieces — full-blown interactive multimedia will remain confined to corporations and educational institutions for some time to come.

The impact on education

Perhaps a larger issue is the impact that interactive multimedia will have on schools and students. The workbook that accompanies Apple's The Visual Almanac waxes about how "history comes alive when you can hear the voices of the past and see the world's leaders at significant moments." Will seeing a clip of violent border clashes help students understand the roots of the Arab-Israeli conflict?

What about the history that took place before the inventions of sound recording and photography? And what about disciplines that don't benefit from computer graphics and old news clips, such as literature? How can students concentrate in an expository writing class when they know they'll be flying around the solar system or watching Ted Koppel in their next period? After a few years of nonlinear, TV-based education, will they be able to concentrate at all?

Control it before it controls you

Smart educators and curriculum planners should definitely be in on the ground floor of interactive multimedia, not only to prepare for what appear to be tomorrow's teaching techniques, but to shape those techniques into being more than technological diversions. To paraphrase Neil Postman: Instead of asking how can we use television and the computer to control education, we should be asking how we can use education to control television and the computer.

As for QuickTime, there's no question that it is an impressive piece of software technology and that it paves the way for new forms of computer-based entertainment and education. But will it change the way you work?

If you already use animation software, you can take advantage of QuickTime's standard movie file format. If you create presentations, you can experiment with making them more dynamic — adding animated charts for example, or clips from a CD-ROM. If you're a film or broadcasting pro, you can get in on the ground floor of what promises to be as big a revolution for your industry as desktop publishing was for the print media.

But if you primarily work in word processors, spreadsheets, and database programs, QuickTime may not have much to offer you. Dynamic data is a slick concept, but most people work with static data. It served us well for centuries until television and sound bites came along.

CHAPTER 21 CONCEPTS AND TERMS

- Multimedia is the use of words, sounds, and still and moving pictures to convey ideas, sell products, educate, and entertain.
- At its most basic level, multimedia may involve jazzing up a slide presentation with music and narration. More advanced levels of multimedia use an authoring program to provide interactivity.
- QuickTime is a system extension that enables Mac programs to work with dynamic data such as sound, video, and animation. A piece of dynamic data is called a movie. You can create QuickTime movies using a video recorder or with a wide variety of programs, such as animation and 3-D drawing packages.
- Multimedia and QuickTime can make use of every category of video hardware. For capturing video from a camcorder, videodisc player, or VCR, you need a frame grabber board. For recording your productions on videotape, you need a board (or a Mac) that can output NTSC video.
- The rules that describe the format of a composite video signal were developed about 30 years ago by the National Television System Committee (NTSC). In many ways, the Mac's standard video signal is technically superior to NTSC video.
- To create final QuickTime movies from digitized clips, you need a video editing program such as Adobe Premiere or DiVA VideoShop.
- To design titles and other graphics to look their best within the limited resolution and 30Hz frame rate of NTSC video, avoid thin parallel lines and choose fonts and colors carefully.

authoring program
A program, such as HyperCard, Macromedia Director, or Authorware Professional, that lets you integrate text and visuals, and add on-screen buttons and other hot spots that enable users to interact with the production by branching to different areas of interest.

broadcast video
Another term for NTSC video — the standard format for commercial television in the United States and Japan.

cel animation
An animation technique in which a background is drawn or painted on paper, over which are laid transparent sheets of celluloid containing only those components of the frame that have moved since the previous frame, eliminating the need to redraw the background for every frame. Many animation programs electronically recreate this technique on the Mac.

codecs
Compression/decompression extensions that add new compression capabilities to QuickTime.

composite video
A video-display technique in which the red, green, and blue signals are merged with the sync signals into a technically simple composite signal that lacks the sharpness and clarity of RGB video (see *RGB video*).

compression
Reducing the storage requirements of an image or video sequence. Spatial compression saves space by removing information within a single image or video frame. Temporal compression, also called *frame differencing,* saves space by only describing the changes between frames.

controlled capture
Digitizing a movie one frame at a time using a videodisc player, VCR, or other video device that is attached to and controlled by the Mac (see *live capture*).

edit-decision list
Abbreviated EDL, a list of all the clips, transitions, and special effects in a production. EDLs are used by professional video production equipment to assemble a final production from the source tapes.

field
In NTSC video, a set of odd- or even-numbered scan lines. Each field is painted 30 times per second, giving NTSC video a frame rate of 30Hz.

frame
In video, one complete set of odd- and even-numbered scan lines. In animation, one of many still pictures that, when played rapidly, provide the illusion of motion.

frame grabber
An add-on board that enables the Mac to digitize video frames and create a QuickTime movie of the results.

frame rate
The number of frames displayed per second.

interlaced video
A video technique in which each frame is painted in two passes: The odd-numbered scan lines are drawn first, followed by the even-numbered scan lines.

live capture
Digitizing movies in real time, as a videotape plays back or as you simply point a camcorder at the subject (see *controlled capture*).

movie
A recorded sound and/or series of video frames stored in QuickTime's MooV format.

overscan
A television industry practice in which the image projected onto a television's video tube is larger than will fit (see *underscan*).

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(continued from the previous page)

path-based animation
An animation feature in which you draw lines that describe the path that moving objects will take. The program then generates the frames necessary to put the objects into motion.

RGB video
Short for red-green-blue, the video-display technique used by the Mac. With RGB video, the signals for red, green, and blue each travel on a separate wire. Other wires carry synchronization signals (see *composite video*).

tweening
An animation feature in which you create the first and last frames (the *key frames*) of a sequence, specifying the beginning and ending appearance of an object and the total number of frames desired for the sequence. The animation program creates the necessary number of frames and moves the object from one frame to the next.

underscan
A video-display technique in which the image projected on the video screen is smaller than the tube's surface. Computers underscan in order to show every pixel.

CHAPTER TWENTY-TWO

Music and Sound

IN THIS CHAPTER

- Looking at the Mac's many musical roles
- Applying digital audio — from error beeps to presentations to compact discs
- Using Macromedia's MacRecorder Sound System Pro and SoundEdit software
- Attaching your Mac to a stereo system for better sound quality
- Working with sound in Adobe Premiere, Aldus Persuasion, and Macromedia Director
- Assessing the sound features in Apple's AV Macs

For Mac owners with a musical bent, this is a wonderful time to be alive. The Mac may be best known for changing the way people publish, but it has become a prominent force in the way people make and record music too. Whether you're a beginner who has trouble pecking out Chopsticks, a film score composer, or lead guitarist for the Bleeding Eardrums, there's a place for the Mac in your musical life.

And you don't have to break the bank to find it. You can sample the world of computer music applications for nothing more than the price of a program and a cable to hook your Macintosh into a stereo system. When you're ready to move up to a synthesizer you'll be pleasantly surprised. The same electronics advances that have spawned $9.95 digital watches have made possible synthesizers that cost less than a color television.

Sounds for All Seasons

ON THE CD

- Opcode's Audioshop and Musicshop
- Macromedia's SoundEdit Pro
- Echo Chamber (The Best of BMUG)
- Jim Heid's Sounds
- Passport Designs' Pro 5, Encore, MusicTime, and Passport Producer

The Mac's own ability to record, manipulate, and play back sound is also opening doors to new applications in education, entertainment, music, business, and science. And of course, on a more basic level, it lets you change the way your Mac sounds when you make a mistake: If you've explored the Sound control panel, you've noticed that you can choose from several digitally recorded beep sounds — a simple beep, a clanking sound, a springy "boing" (reminds me of the suspension on my first car), or a monkey's squawk, which, for you Mac trivia buffs, was actually created by a woman named Sandi Dobrowolsky, now a Claris employee.

In this chapter, I show you the ways in which you and a Mac can make beautiful music together, and I'll examine the roles digital audio plays in the Mac world. Along the way, I'll spotlight some of the sound-oriented products available for the Mac. The Quick Tips box "The Mac Sounds Off," explains how to modify your System file to add your own digitally recorded system beeps, and it reveals some sources for prerecorded sounds.

Music to the Macs

The Macintosh is a multitalented performer. In fact, a Mac can play so many musical roles that it may help to briefly audition each role before taking a closer look.

Sequencing

Several programs turn the Mac into an electronic multitrack recorder that records, edits, and plays back performances using one or more synthesizers attached to the Mac. The alchemy that makes this possible goes by the name Musical Instrument Digital Interface (MIDI), a synthesizer-communications standard built into virtually every synthesizer and electronic instrument made today.

The Mac Sounds Off

You can add to the Mac's repertoire of digital beep sounds by adding sound resources to your System file. Thousands of prerecorded sounds are available through on-line services such as America Online and CompuServe, through user groups, and through public domain and shareware clearing houses.

Macromedia's SoundEdit Pro, Digidesign's Sound Designer II, and Passport Design's Alchemy can save sound resources directly in the System file (or any other file, for that matter). You can also use SoundMover, a shareware utility by Riccardo Ettore, or Apple's ResEdit.

Regardless of the program you use, be sure to make a backup copy of your System file in case something goes amiss during the modification process. After you add a sound resource, use the Sound control panel to select it as the current system beep.

Using a variety of shareware system extensions, you can make your Mac sound off at other times, too. Two particularly noteworthy shareware sound extensions include SoundMaster (by Bruce Tomlin) and Chime (by Robert Flickinger; free). SoundMaster lets the Mac play sounds when you perform any of over a dozen tasks (such as inserting or ejecting a disk). Chime plays up to four separate sounds on the hour and at 15, 30, and 45 minutes past.

Scoring

The process of putting notes on paper is traditionally a grueling task for composers, who must wrestle with staff paper and white-out, and for music publishing houses, which often use a mutated typewriter called a Musicwriter. Scoring programs do for composers what word processors have done for writers.

Composition

A fascinating genre of programs lets the Mac collaborate with you, storing groups of phrases you have entered, analyzing their structure, and rearranging the notes into new rhythms and patterns based on the originals.

Sound editing

With many electronic instruments, adjusting the many knobs and buttons required to produce a desired sound is so difficult that many players stick with the instruments' built-in sounds, often called *patches* (named in honor of the pioneering synthesizers of the sixties, whose many sound-generating modules were linked by patch cables like those for a telephone switchboard). Patch editor programs let you draw and manipulate the waveforms that describe a sound's qualities, and then transfer them to a synthesizer's memory.

Patch management

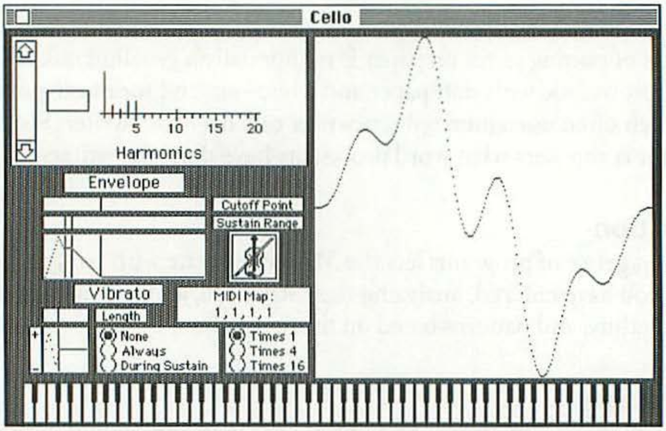
Most synthesizers can store dozens of patches, but that isn't enough for real sound hounds. *Patch librarians* are database managers for patches; these programs transfer the settings making up each patch to or from a Macintosh disk. Patch librarians also let you cut and paste patches from one file to another, so you can organize sounds according to your performance needs. Most patch editors also provide librarian features.

Sound track production

For years, film and recording studios have used a timing standard called the SMPTE edit time code. (SMPTE, pronounced *simpty*, stands for Society of Motion Picture and Television Engineers.) The SMPTE code enables engineers to synchronize a sound track with an action. Many sequencers, as well as a variety of *cue* programs, work with the SMPTE code to simplify the chore of calculating how long a musical passage must be in order to fit a given scene.

Songs for beginners

You say you're neither a synthesizer owner nor a sound track composer? You can still choose from a combination of programs designed to let you sound off with a minimal musical background and no additional equipment.



MIDI Map:
1, 1, 1, 1

Length
● None
○ Always
○ During Sustain

● Times 1
○ Times 4
○ Times 16

Figure 22-1: Designing Instruments ConcertWare Pro's Instrument Maker lets you design instruments by specifying the characteristics of their waveform, harmonics, and envelope. You can hear your efforts by clicking on the on-screen piano keyboard, and you can save instruments for use with ConcertWare Pro.

Foremost among such packages is Great Wave Software's ConcertWare Pro. With ConcertWare Pro, you enter music on conventional staves by using the mouse and on-screen palettes, which provide one-click access to note and rest values. ConcertWare Pro also lets you cut, copy, and paste passages and print your compositions, which can have up to 32 parts. The program isn't intended to be a full-fledged scoring tool: You probably wouldn't use it for music publishing applications that I'll discuss later. But it is an ideal program for composers and students.

ConcertWare Pro is also an ideal tool for learning about sound. Using the package's Instrument Maker program, you draw and edit waveforms and define a sound *envelope*, which governs a sound's percussiveness (see Figure 22-1 "Designing Instruments"). For example, a piano has a sharp attack (as the hammers hit the strings) and a gradual decay (as the strings stop vibrating and the sound fades out). Wind instruments have a gradual attack and little decay until the musician runs out of breath.

Aural gratification

Considering the Mac's limited sound-synthesizing capabilities, the end product of ConcertWare Pro's Instrument Maker program is surprisingly good. But if it's not good enough for you, ConcertWare Pro can send songs to a synthesizer, or let you enter songs from a synthesizer.

If the notion of playing a song and then printing out its score sounds too good to be true, it is. Any performer's rendition of a piece varies from the precise timing specified by music notation. ConcertWare Pro, as well as professional sequencer and scoring packages, must attempt to round off variances in timing through a process called *quantization.* Generally the process works well, but you still must fine-tune the final score.

Jamming with the Mac

If you don't have a synthesizer and you aren't happy with the Mac's attempt to imitate one, consider Bogas Productions' Super Studio Session or Brøderbund Software's Jam Session, both of which use *sampled* sound. Sampled sound is a digitized version of the real thing, produced by feeding an audio signal into a hardware device called an *analog-to-digital converter*, which turns a continuously varying (analog) sound wave, the kind our ears recognize, into a series of numbers stored by sampling software. If you've ever marveled at a compact disc's startling clarity, you've experienced the most common application of sampled sound.

The instrument sounds included with Super Studio Session and Jam Session can't approach a compact disc's realism. Still, both are remarkable programs. Jam Session includes numerous songs in a variety of styles, from reggae to rock to classical to country. Each key on the Mac's keyboard is assigned to a prerecorded *riff* (a series of notes) or a sound effect such as a cheering or applauding crowd; you can improvise solos (and cheer yourself on) by pressing keys as a song plays, and Jam Session works to ensure that everything you play is in the right key and tempo. And on the screen, an animated band boogies to your beat.

Super Studio Session includes additional features, including a music editor that lets you create new songs. CompuServe, America Online, and user group libraries are brimming with songs and additional instrument sounds. You can also create your own sounds using a Mac with sound-recording hardware.

More on MIDI

In 1982 the largest companies in the electronic music industry overcame their normally secretive and competitive urges and agreed to cooperate. The result of their collaboration was not a hot new musical instrument, but a 13-page document that has literally changed the way the world makes music.

That document described the MIDI specification. MIDI was developed to enable musicians to connect electronic instruments to each other and to computers. The MIDI specification spells out the types of wires and connectors that unite musical instruments, as well as the commands and codes that MIDI-equipped instruments transmit and respond to. Generally, any piece of equipment with MIDI — whether a musical instrument or a computer — can talk with any other piece of MIDI gear.

On a basic level, MIDI lets you create a network of two or more instruments that you can play from just one instrument. Musicians often use this technique, called *layering*, to play multiple instruments simultaneously to obtain a richer sound.

On a somewhat more advanced level, MIDI lets you connect one or more instruments to a computer to record and play back music and add accompaniments. This aspect of MIDI has helped create a new phenomenon — the home recording studio. And at its most advanced level, MIDI lets you combine a computer-controlled network of instruments with audio equipment and even stage lighting to automate an entire performance environment.

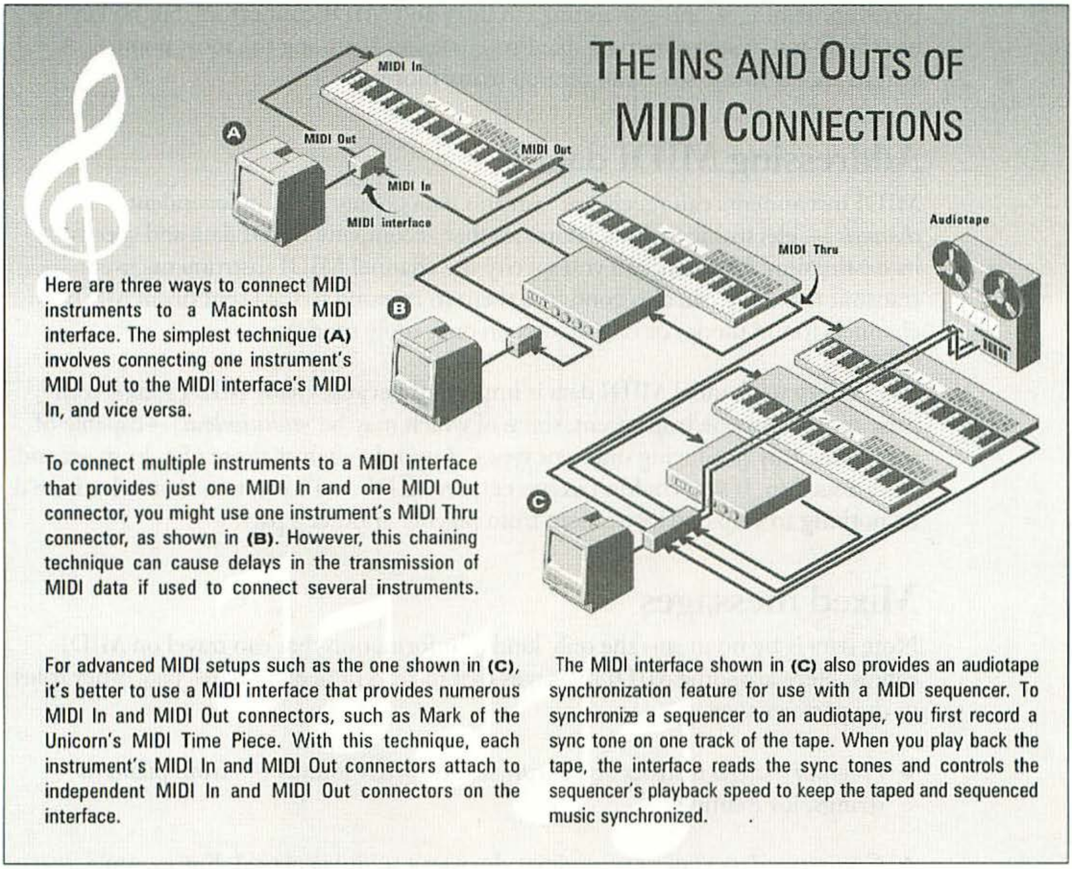
MIDI Basics

MIDI data can travel in two directions at the same time — from an instrument to a computer and from a computer to an instrument. To accommodate this two-way traffic, every MIDI device has two connectors — MIDI In and MIDI Out. Some devices have another connector called MIDI Thru, which can be used for chaining MIDI devices together.

The interfaces of Mac and MIDI

Peer behind the Mac and you'll notice there are no such connectors. Unlike some personal computers, Macs don't come equipped for MIDI but need a separate piece of hardware called a *MIDI interface*, which connects to the Mac's modem or printer port and provides MIDI In and MIDI Out connectors. Several are available for the Mac, ranging from Apple's $99 Apple MIDI Interface to Opcode's Studio 5 and Mark of the Unicorn's MIDI Time Piece II. The high-end MIDI interfaces provide more MIDI In and MIDI Out connectors, enabling you to create a larger MIDI network. They also provide sync features that enable the Mac's MIDI playback to be synchronized with an external device such as an audio tape recorder. More about syncing later.

Figure 22-2 "The Ins and Outs of MIDI Connections," shows three different ways to connect MIDI instruments with an interface to relay MIDI data (also called *messages* or *events*) between instruments and a Mac.



THE INS AND OUTS OF MIDI CONNECTIONS

Here are three ways to connect MIDI instruments to a Macintosh MIDI interface. The simplest technique **(A)** involves connecting one instrument's MIDI Out to the MIDI interface's MIDI In, and vice versa.

To connect multiple instruments to a MIDI interface that provides just one MIDI In and one MIDI Out connector, you might use one instrument's MIDI Thru connector, as shown in **(B)**. However, this chaining technique can cause delays in the transmission of MIDI data if used to connect several instruments.

For advanced MIDI setups such as the one shown in **(C)**, it's better to use a MIDI interface that provides numerous MIDI In and MIDI Out connectors, such as Mark of the Unicorn's MIDI Time Piece. With this technique, each instrument's MIDI In and MIDI Out connectors attach to independent MIDI In and MIDI Out connectors on the interface.

The MIDI interface shown in **(C)** also provides an audiotape synchronization feature for use with a MIDI sequencer. To synchronize a sequencer to an audiotape, you first record a sync tone on one track of the tape. When you play back the tape, the interface reads the sync tones and controls the sequencer's playback speed to keep the taped and sequenced music synchronized.

Figure 22-2: The Ins and Outs of MIDI Connections

What kind of data travels via MIDI? First and foremost, *note data.* When you play a MIDI instrument's keyboard, it tells the Mac which keys were pressed and for how long. Velocity-sensitive keyboards also note how hard each key was pressed, letting the Mac capture the varied dynamics of your performance.

Alternative MIDI controllers

Incidentally, MIDI instruments don't necessarily have to have piano-like keyboards. They can take other forms, ranging from the self-explanatory MIDI guitar and drum pad to the not-so-self-explanatory saxophone-like wind controller. MIDI-equipped accordions are available, as are retrofits that add MIDI to organs and acoustic pianos. Instruments that generate MIDI data are often called *controllers.* Many musicians combine one controller with several *sound modules* —

boxes containing sound-generating circuitry and MIDI connectors, but no keyboards. E-mu Systems' remarkable Proteus series is among the most popular. A visit to a local music store can turn up many more.

Addressing MIDI data

MIDI instruments can receive or transmit data on any of 16 independent *channels* — electronic mailing addresses that accompany MIDI data and specify its destination. Not only can you specify the channel MIDI instruments use to transmit data, you can also configure them to respond to data sent on all MIDI channels (omni mode) or only to certain ones (poly mode).

This ability to channel MIDI data is important because many MIDI setups comprise more than one instrument, some of which may be *multitimbral* — capable of simultaneously producing different types of sounds, such as those of a drum set and a horn section. If you couldn't assign certain MIDI data to certain channels, there'd be nothing to stop one instrument from playing another's part.

Mixed messages

Note data is by no means the only kind of information that can travel on MIDI cables. Here are some MIDI messages that instead of playing notes play other roles in the performance.

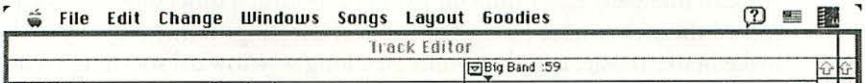
- *Program changes* instruct an instrument to switch sounds — from piano to strings, for example.
- *Continuous data* generally modifies the way a sound is played. For example, many instruments have *pitch bend* wheels or levers that let you slide between pitches the way guitar players do when they bend a string. Another kind of continuous data is *aftertouch*, which describes how hard a note key is being held down. By pressing harder on a key after you press it, you may add vibrato or cause a string sound to get progressively louder. Not all keyboards send aftertouch, but those that do allow for a greater range of expression.
- *Clock* or *sync data* carries information about the timing of a MIDI performance. It's often used to synchronize a network of MIDI instruments to an audio tape recording.
- *System-exclusive data* includes information pertinent to a specific model of MIDI instrument, such as the contents of its internal memory, or the MIDI-channel assignments of its sounds. By transferring system-exclusive data to the Mac, you can store and alter an instrument's sounds, and then transfer the data back to the MIDI instrument.

Software to Make Music By

Without a computer, MIDI data plays a valuable but limited role: It lets you play numerous instruments using just one controller. MIDI data becomes much more useful when it's combined with a computer and software that can store and manipulate it. The most popular kind of MIDI software is the *sequencer*, a kind of tapeless tape deck that lets you build your own arrangements by recording parts one track at a time. You may start with a drum or bass track to establish a rhythm, and perhaps specify that it loop, or repeat, continuously. Next, you may add a guitar melody, and then some strings to sweeten things up. During playback, you route the tracks to the appropriate instruments or to the appropriate sounds within a multitimbral instrument by specifying a different playback channel for each one (see Figure 22-3 "Laying Down Tracks").

A sequencer is not a tape deck

On the surface, a sequencer seems similar to a multitrack tape recorder or to a digital audio–recording system such as Digidesign's Audiomedia or Sound Tools. But a sequencer doesn't store sound; instead, it stores the sequence of MIDI data that describes what you played.



Tk	P	R	S	L	Name	Chnl	Prg
1	▶				Piano	A1	1
2	▶				Bass	A2	33
3	▶				Trumpets	A3	57
4	▶				Tbones	A4	58
5	▶				Alto Sax	A5	66
6	▶				Tenors	A6	67
7	▶				Bari.Sax	A7	68
8	▶				Guitar	A8	27
9	▶				Drums	A10	-
10	▶				© 1991	A16	-
11	▶				Passport Designs,Inc	A16	-
12	▶				Prod. by Music Data	A16	-
13						A -	-
14						A -	-
15						A -	-
16						A -	-
17						A -	-
18						A -	-
19						A -	-
20						A -	-
21						A -	-
22						A -	-
23						A -	-
24						A -	-
25						A -	-

Figure 22-3: Laying Down Tracks Sequencers (such as Passport Designs' Pro 5, shown here) let you record and play back MIDI data. The dark bars on the right indicate the presence of MIDI data in those measures. At the top of the window is a marker (here named Big Band), which you can create to quickly access a specific point. Most sequencers provide these basic features.

That storage technique has a few significant pluses. First, MIDI data requires far less disk space than digital audio data does. A ten-minute stereo recording made with Pro Tools requires 100MB of disk space; a ten-minute MIDI sequence may use 30K or so. Also, because the MIDI data in a sequence isn't tied to a particular sound, you can change an instrument's settings before or during playback to hear how that electric guitar part sounds when played by an acoustic guitar or maybe an oboe. You can also work up an arrangement using an economical home system and then take your disk into a recording studio and play the sequence using state-of-the-art gear.

And because you're working with MIDI data, you can continue adding tracks without compromising the sound quality. With an audio recording, each time you bounce two or more tracks to a single track to free up a track for recording, the sound quality of the older tracks suffers. With a sequencer, the tracks exist in the Mac's memory, not on audio tape. So you can add as many tracks as you have memory for, and every playback is an original performance.

MIDI Vanilli

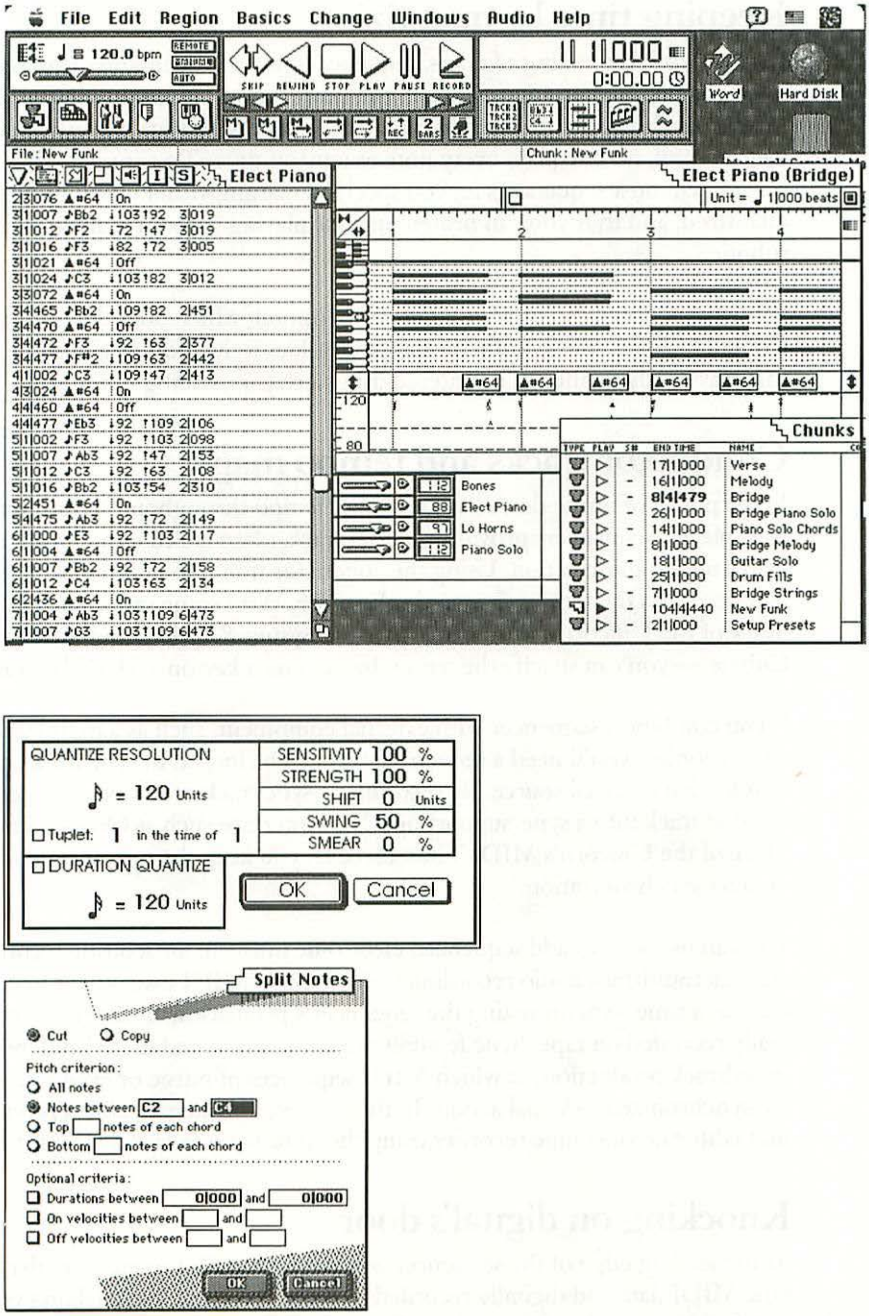
Perhaps best of all (at least for those of us who can't practice eight hours a day), you can use a sequencer's extensive editing features to correct misplayed notes or to add more dynamic expression. You can cut and paste sections of a recording, for example, to remove extra verses or repeat a part. And with a sequencer's step recording mode, you can manually enter difficult parts one note at a time, or slow down the tempo and record them at a more leisurely pace. Is it cheating? Some may say so, but it lets you make better music, and the results go a long way toward soothing your guilt.

Sequencer Editing Features

Here's a closer look at the kinds of features you can find in Macintosh sequencers.

For correcting or inserting notes in existing tracks, three basic schemes exist. Graphic editing displays a track's contents on a music staff–like grid, except that notes are shown as horizontal bars, with longer bars representing longer notes. Graphic editing lets you select and drag notes from one position to another using the mouse. Because a graphic editing display resembles a player piano roll, it's often called a *piano roll display.* Finally, some programs, such as Mark of the Unicorn's Performer and Dynaware's Ballade, can display a sequence in standard music notation.

Event list editing displays a track's contents as a table of MIDI data. It doesn't give you the click-and-drag convenience of graphic editing, but it allows for greater precision, because you can type and edit the exact values that describe individual notes or other MIDI data. Better sequencers provide both types of editing windows (see Figure 22-4 "Editing Tracks").



File: New Funk

Chunk: New Funk

```
2|3|076 ▲#64  On
3|1|007 ♪Bb2  ↓103↑92  3|019
3|1|012 ♪F2   ↓72 ↑47  3|019
3|1|016 ♪F3   ↓82 ↑72  3|005
3|1|021 ▲#64  Off
3|1|024 ♪C3   ↓103↑82  3|012
3|3|072 ▲#64  On
3|4|465 ♪Bb2  ↓109↑82  2|451
3|4|470 ▲#64  Off
3|4|472 ♪F3   ↓92 ↑63  2|377
3|4|477 ♪F#2  ↓109↑63  2|442
4|1|002 ♪C3   ↓109↑47  2|413
4|3|024 ▲#64  On
4|4|460 ▲#64  Off
4|4|477 ♪Eb3  ↓92 ↑109 2|106
5|1|002 ♪F3   ↓92 ↑103 2|098
5|1|007 ♪Ab3  ↓92 ↑47  2|153
5|1|012 ♪C3   ↓92 ↑63  2|108
5|1|016 ♪Bb2  ↓103↑54  2|310
5|2|451 ▲#64  On
5|4|475 ♪Ab3  ↓92 ↑72  2|149
6|1|000 ♪E3   ↓92 ↑103 2|117
6|1|004 ▲#64  Off
6|1|007 ♪Bb2  ↓92 ↑72  2|158
6|1|012 ♪C4   ↓103↑63  2|134
6|2|436 ▲#64  On
7|1|004 ♪Ab3  ↓103↑109 6|473
7|1|007 ♪G3   ↓103↑109 6|473
```

TYPE	PLAY	S#	END TIME	NAME
	▷	-	17|1|000	Verse
	▷	-	16|1|000	Melody
	▷	-	**8|4|479**	Bridge
	▷	-	26|1|000	Bridge Piano Solo
	▷	-	14|1|000	Piano Solo Chords
	▷	-	8|1|000	Bridge Melody
	▷	-	18|1|000	Guitar Solo
	▷	-	25|1|000	Drum Fills
	▷	-	7|1|000	Bridge Strings
	▶	-	104|4|440	New Funk
	▷	-	2|1|000	Setup Presets

QUANTIZE RESOLUTION
♪ = 120 Units
☐ Tuplet: 1 in the time of 1
SENSITIVITY 100 %
STRENGTH 100 %
SHIFT 0 Units
SWING 50 %
SMEAR 0 %
☐ DURATION QUANTIZE
♪ = 120 Units

● Cut ○ Copy

Pitch criterion:
○ All notes
● Notes between C2 and C4
○ Top ☐ notes of each chord
○ Bottom ☐ notes of each chord

Optional criteria:
☐ Durations between 0|000 and 0|000
☐ On velocities between ☐ and ☐
☐ Off velocities between ☐ and ☐

Figure 22-4: Editing Tracks The graphic and event list editing windows in Mark of the Unicorn's Performer(top). The entries reading #64 indicate the press and release of a MIDI keyboard's sustain pedal. The quantizing dialog box in Opcode's Vision (middle), and Performer's Split Notes dialog box (bottom), which lets you extract certain notes from a track. One use for Split Notes is to separate the left- and right-hand parts of a track.

Keeping time by quantizing

For tweaking the timing of notes, sequencers provide quantizing features, which cause the program to move notes to the nearest note value you specify. If used excessively, however, quantizing can give sequenced music an overly mechanized feel; after all, no one plays every note exactly on time. To eliminate this undesirable side effect, most sequencers let you specify a margin within which notes aren't quantized, and thus you can neaten up your playing without making it sound robotic.

Some sequencers also provide a humanize option, which does the opposite of quantizing: It nudges notes off their exact beat values to improve the feel of a passage that was overly quantized or entered using a step-recording mode.

Conductor tracks and tempo maps

Many pieces of music don't have the same tempo throughout. To accommodate such pieces, sequencers provide a special track, often called a *conductor track*, that stores tempo information. Using the conductor track, you can create a tempo map that describes the tempo changes in the piece. With some sequencers — including Mark of the Unicorn's Performer, Opcode Systems' Vision, and Steinberg-Jones's Cubase — you can specify the tempo by tapping a key on a MIDI keyboard.

If you combine a sequencer with external equipment, such as a multitrack audio tape recorder, you'll need a sequencer that can be locked to synchronization codes sent by that external source. By recording a sync track on a tape recorder and feeding that track into a sync-supporting MIDI interface such as Opcode's Studio 5 or Mark of the Unicorn's MIDI Time Piece II, you keep the sequencer and recorder in exact synchronization.

You can use sync to add sequenced electronic music to an acoustic recording, or to create a multitrack audio recording using a single MIDI instrument to record one track at a time, synchronizing the sequencer's playback with the tracks you've already recorded on tape. Sync features are commonly used in TV and movie soundtrack production, in which MIDI sequences of music or even sound effects are synchronized to visual action. In these cases, a sequencer is synchronized to a film editor or videotape recorder using the industry standard SMPTE time code.

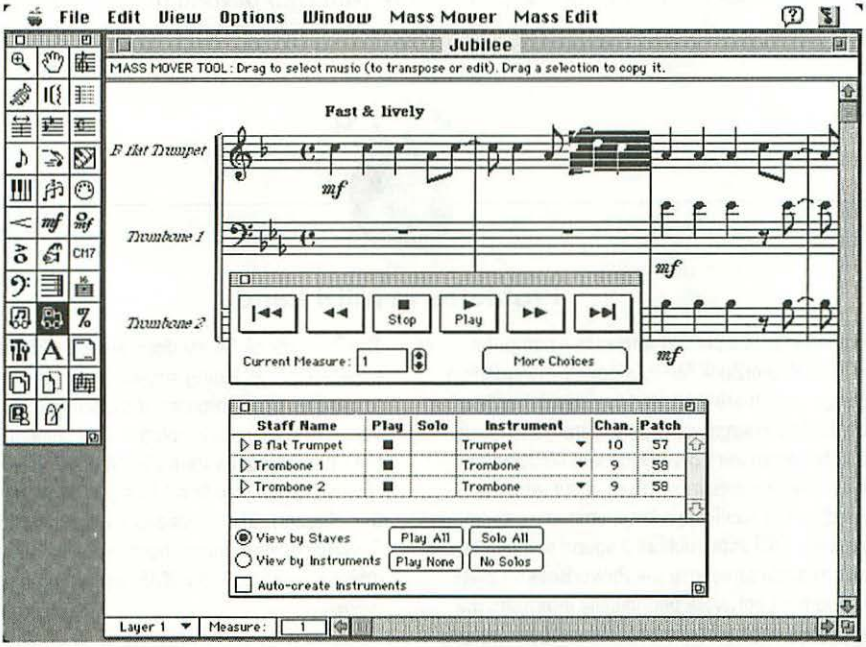
Knocking on digital's door

At the leading edge of the sequencer world, you can find sequencers that can combine MIDI data and digitally recorded audio in the same file, enabling you to add vocals or acoustic instrument recordings to a sequence. Sequencers that support hard disk digital audio recording include Mark of the Unicorn's Digital Performer, Opcode's Studio Vision, Steinberg's Cubase Audio, and OSC's Metro. To record audio with these products, you need appropriate digital audio hardware, such as Digidesign's Sound Tools II or Audiomedia (discussed later in this chapter). I used Digital Performer to record parts of the audio program on the *Macworld Complete Mac CD* included with this book.

If you're a pro, you may end up using more than one sequencer. Fortunately, virtually all support the standard MIDI file format, which enables sequencers — even ones running on different computers — to exchange recordings. Often MIDI files are also used along with scoring programs — the next stop on your MIDI tour.

Music Processors

Scoring programs let you print music using conventional notation. They do for composers what word processors do for writers — easily correct and revise a piece without a lot of erasing (see Figure 22-5 "Scoring Software").



MASS MOVER TOOL : Drag to select music (to transpose or edit). Drag a selection to copy it.

Staff Name	Play	Solo	Instrument	Chan.	Patch
▷ B flat Trumpet	■		Trumpet ▾	10	57
▷ Trombone 1	■		Trombone ▾	9	58
▷ Trombone 2	■		Trombone ▾	9	58

● View by Staves
○ View by Instruments
☐ Auto-create Instruments

Figure 22-5: Scoring Software Notation programs such as Finale (shown here), let you commit music to paper by entering notes individually from a tool palette, playing a MIDI instrument, or importing a MIDI file created by a sequencer. The latter two approaches sound especially appealing, but music entered directly from a performance often requires extensive quantizing to compensate for minor timing inaccuracies.

Even more exciting, scoring programs can transcribe music as you play it on a MIDI keyboard. Real-time music transcription has been a fantasy of musicians for years, and the dream still hasn't been completely fulfilled. The primary problem is one I mentioned before: Nobody plays every note exactly on time. A real-time transcription is likely to have a large number of awkward rests and unusual note values you need to clean up using the scoring program's editing features.

Scoring programs help you get better results by quantizing data as you play it (or load it from a MIDI file), but don't expect perfect notation the first time around. These real-time entry features are most effective when used as a starting point.

Numerous scoring programs are available for the Mac, including Mark of the Unicorn's Mosaic, Passport Designs' MusicWriter and Encore, Coda's Finale, Opcode's MusicShop, and Great Wave Software's ConcertWare Pro. MusicShop and ConcertWare Pro provide beginner- to intermediate-level scoring features. The rest are geared toward professionals and offer more control over the elements of a score.

All of these programs take advantage of Adobe Systems' Sonata music font to produce sharp copy on LaserWriters and other PostScript printers. (Many programs, including Coda's, include additional PostScript fonts for producing specialized notation symbols such as guitar chord patterns.) Beyond that, each program pro-

POWERBOOK ANGLE

Problems in MIDI Land

A PowerBook is a perfect musician's computer — or is it? The PowerBook family's power-management features, which are designed to extend the life of each battery charge, can cause data-transmission errors between the PowerBook and MIDI instruments. These errors most often occur when the PowerBook is receiving a large amount of system-exclusive MIDI data such as a sound sample. The problem occurs because the PowerBook's power-management software periodically interrupts the computer's central processor. When these interruptions occur, MIDI errors can occur, too.

The PowerBook family does work well for most MIDI applications, including sequencing. But if you need to transfer large amounts of system-exclusive data, you may encounter problems. One solution is to use the Open Music System (OMS) driver (see the "Every Combo Needs a Manager" section later in this chapter). OMS versions 1.2 and later fix the PowerBook communications problem. The OMS driver is included with OMS-supporting music software.

vides its own notation strengths; if you're a serious composer, you should evaluate them all to find the one that best handles the notation requirements of the style of music and the instruments you're writing for.

While you're at it, you may want to investigate free or shareware scoring programs such as Lime, from the CERL Music Group at the University of Illinois and the Department of Computer and Information Science at Queen's University. Lime and a large selection of music notation fonts are available through most user groups and on-line services.

Sounds Good

As mentioned at the beginning of this chapter, editor/librarians let you manage, alter, and save a MIDI instrument's sounds by manipulating system-exclusive MIDI data. You may use an editor/librarian to tweak an existing sound to your liking or to create a new sound from scratch.

Tweaking sounds with editor/librarians

You can alter a MIDI instrument's sounds using its front-panel knobs and switches, but an editor/librarian makes it easier by taking advantage of the Mac's graphical operating style. For example, giving a sound a sharper, more percussive quality may require 15 minutes of twiddling with an instrument's knobs while squinting at its small, calculator-like display. With an editor/librarian, you can edit an on-screen version of the sound, clicking and dragging its components until you get the sound you want.

Editor/librarians are available for all popular MIDI instruments. Some, such as Opcode's Galaxy and Mark of the Unicorn's Unisyn, can work with numerous instruments, and are often called *universal editor/librarians.*

Summoning patches by name

One recent trend has seen MIDI software vendors integrating their universal editor/librarians with their sequencers. This provides a more convenient sequencing environment in which you can summon patches by name instead of by number. Opcode's Galaxy editor/librarian works with Vision and Studio Vision, while Mark of the Unicorn's Unisyn works with Performer and Digital Performer.

Sampling Samplers

Just as digital sound has made its mark in the Mac world, it has also significantly influenced the music industry. Musicians are embracing a new generation of keyboards called *samplers*. Like a Mac with a microphone or a MacRecorder, a sampler digitally records and plays back sound. But with a sampler, you can play the sound at different pitches simply by pressing different keys. Record just one pitch of a given instrument, and you can instantly play that instrument from the sampler's keyboard.

Actually, most samples sound artificial when transposed too high or too low. Therefore, most sampling keyboards divide the range of notes into multiple samples, each of which plays a range of only an octave or so. This technique, called *multisampling*, avoids having to transpose a sample too high or low.

Programs like Digidesign's Sound Designer II let you simultaneously view and alter a sampler's sounds. This capability is especially useful for setting a *loop point*, a portion of a sample that repeats as long as a key is pressed. Because few samplers display waveforms graphically, it's difficult to find the perfect loop point using a sampler's editing commands. When you can see the waveform, however, setting loop points is far easier.

Another popular sample-editing program is Passport Design's Alchemy, which performs much of the same magic as Sound Designer II. One of Alchemy's primary strengths is its ability to change the sampling rate of a recorded sound. This resampling capability enables you to transfer sounds between samplers that use different rates. Musicians can store all their sound samples on the Mac and use Alchemy to shuttle them between samplers as needed for more versatility.

If you have a sampler, you may also want to investigate Digidesign's Turbosynth software, which lets you design synthesized sounds on the Mac and then transfer them to a sampler for playback. Turbosynth gives a sampler, whose normal purpose is to play back digital recordings of real instruments, the sound-generating versatility of a synthesizer.

Every Combo Needs a Manager

If you try to run several MIDI programs simultaneously under System 7 (or System 6 MultiFinder), you may experience compatibility problems. That's because some MIDI programs monopolize the Mac's communications chips, preventing other programs from using them.

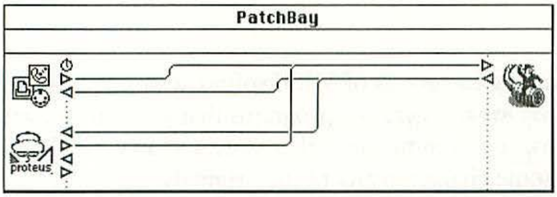


Figure 22-6: MIDI Patching Apple's PatchBay application graphically depicts the connections between the MIDI Manager (upper-right icon) and your MIDI hardware and software. Here, connections have been established between the MIDI Manager and Digidesign's MacProteus (far left), and the MacProteus' Front Panel application, which lets you adjust instrument settings and MIDI parameters. MacProteus is a version of E-mu's Proteus that plugs into a Mac II's NuBus slot.

But chances are all your MIDI programs can peacefully coexist if you use Apple's MIDI Manager, an enhancement to the Mac's system software that lets multiple MIDI programs run simultaneously and even share the same MIDI data. Instead of accessing the hardware directly, programs access the MIDI Manager, which in turn deals with the hardware. You can establish connections between the various MIDI programs and hardware you use by using Apple's PatchBay application (see Figure 22-6 "MIDI Patching").

Most current MIDI products are compatible with MIDI Manager. Nonetheless, if your setup requires that you use MIDI Manager, it's a good idea to verify that a given piece of MIDI software is compatible with it before you buy. If you don't have to use MIDI Manager, however, don't. It slows your Mac's overall performance.

An alternative to MIDI Manager is the Open Music System (OMS). Developed by Opcode (and originally known as the Opcode MIDI System), OMS is a system extension that acts as a central MIDI driver for OMS-compatible software to communicate with MIDI hardware. OMS also gives you a place to define and store information, such as patch names, about each of your MIDI devices. OMS can then supply this information to other OMS-compatible programs. OMS can work with or without MIDI Manager. As mentioned elsewhere in this chapter, the OMS driver also fixes the MIDI data errors that can occur with the Mac PowerBook family (see the PowerBook Angle box "Problems in MIDI Land").

Smart Songster

One of the most fascinating categories of MIDI software almost defies categorization. I'm referring to *performance software*, programs that you interact with to improvise compositions, and in some cases, that store and analyze phrases and then improvise music with some characteristics of the originals.

Computer composed

Musical Luddites who aim their noses skyward at the notion of computer-composed music haven't played with Jam Factory, one of several intelligent instrument programs from Dr. T's Music Software. In Jam Factory, four players store notes played at a MIDI keyboard, and then the program analyzes the music. From there, the program generates new passages that contain the notes you played, but in a more random order. The order isn't completely random, however, because the probability of a given note occurring depends on how often it occurred in the original phrase. That's what enables Jam Factory's improvisations to resemble the original phrases.

BACKGROUNDER

A Salute to General MIDI

A classic problem with MIDI is that one MIDI instrument's patches may be assigned to different patch numbers on a different MIDI instrument. Try to play a song created for one synthesizer on a different model, and you may find that a trumpet section is playing the drum part and a choir is singing the lead guitar solo.

A version of the MIDI specification called *General MIDI* is designed to fix this problem by establishing a standard set of 128 patches, organized into 16 families — piano, percussion, organ, guitar, bass, strings, ensemble, brass, reed, pipe, synth lead, synth pad, synth effect, ethnic, percussive, and sound effects. Within each family are eight sounds. The patch numbers assigned to these sounds are standardized, so you can be sure, for example, that Patch #7 will always be a harpsichord and Patch #74 will always be a flute — regardless of the company that made the instruments.

All major synthesizer vendors sell General MIDI sound modules. General MIDI is ideal for entry-level MIDI work, home entertainment applications (including games), multimedia, and any application that involves moving sequences between different brands or models of gear. General MIDI doesn't guarantee that a sequence will sound identical regardless of the module used to play it, but it does eliminate twiddling with knobs and flipping through manuals to make sure your MIDI orchestrations are played by the right instruments.

The basic concepts behind Jam Factory aren't new. In 1961, computer music scientists developed what they called an analog composing machine. In one experiment, they used it to analyze Stephen Foster songs and compose new songs that had that Dixie flavor. And even Mozart once experimented with random composition, using dice to choose notes, and then building a melody and supporting harmony based on those selections.

Jam Factory would make the flamboyant Amadeus squeal with glee. The screen is jam-packed with performance controls, buttons, and graphs for altering the phrases Jam Factory plays — their tempo, rhythm, randomness, key signature, and more. Jam Factory turns the Mac into a musical instrument, letting you change the program's renditions of your phrases by playing the on-screen controls. You can store the results of a performance to commit that flash of brilliance to disk, and replay it later.

Music Miscellany

Sequencers, editor/librarians, and scoring programs are the primary players in the MIDI software world. On the fringes, you find programs such as Ars Nova Software's Practica Musica, which is designed to help you train your musical ear and learn music theory. For creating slick drum and rhythm patterns, check out Dr. T's UpBeat. If you're into jazz, look into MiBAC's Jazz Improvisation Software, which lets you quickly create and play along with a MIDI jazz trio accompaniment consisting of piano, bass, and drums. Choose the form, key, and tempo, and then type the chords: MiBAC Jazz does the rest.

There are also MIDI programming tools such as Altech System's MIDI Basic and MIDI Pascal. You can even find prerecorded MIDI sequences, such as Passport Design's Music Data series, which includes elaborately produced sequences of hundreds of Top-40, rhythm-and-blues, country, and classical music pieces. You may use a canned sequence to fine-tune your arranging or improvisation skills, or as an accompaniment to a live performance.

You can also find MIDI support in authoring and production programs such as Macromedia Director and Passport Producer. Their MIDI support lets you trigger a sequenced piece of music or a sound effect at a particular time during a production. HyperCard users can also choose from a variety of XCMDs and XFCNs to add MIDI-control features to stacks.

Where to Learn More About MIDI

If you want to learn more about computer music applications and synthesizers, consider subscribing to *Keyboard* magazine (Cupertino, CA) or *Electronic Musician* (Emeryville, CA). Both magazines review the latest in synthesizers and computer software, but not at the expense of the creative aspects of music making. For a complete guide to making music on the Mac, read *Macworld Music & Sound Bible,* also from IDG Books Worldwide.

Applying Digital Sound

The Mac is not only transforming the way you create and perform music, it's also changing the way you record and listen to sound in general. As with music and MIDI, digital audio can play so many roles that it may help if I summarize each one before taking a closer look at just how digital sound is produced.

Education

Digital sound is used to teach concepts that are difficult to grasp through written words or pictures. What does a red-tailed hawk sound like? How are numbers pronounced in Spanish? What's the difference between legato and staccato? For explaining concepts like these, a sound is worth a thousand words.

Entertainment

Digital sound enlivens games with realism that phony beeps and squawks can't match. In some arcade games, for example, you hear the screaming of fighter jets and the wash of helicopter blades. In Microsoft's Flight Simulator, you hear a digitized airplane engine and the skid of your landing gear.

Music

In music, digital sound plays three roles. On one level, it makes possible Brøderbund Software's remarkable Jam Session, whose digitally recorded instruments turn the Mac into a six-piece band that can make even novice musicians sound good. On another level, the Mac's sound features enable musicians to alter sounds played by digital sampling keyboards such as those made by Ensoniq, E-mu Systems, Roland, Kurzweil, and others. On still another level, some additional hardware can turn the Mac into a professional audio workstation that can record and play back sound with the fidelity of a compact disc.

Business

Digital sound can enliven business presentations and training software. But adding the dimension of sound means donning yet another hat. You may already be playing photographer, videographer, graphic artist, writer, and producer. Recording your own soundtracks means becoming a recording engineer, too. You can bypass much of the work by using prerecorded music clips, but it still helps to understand technicalities such as volume levels, sampling rates, and MIDI.

Science

Scientists and medical researchers use Mac sound products to analyze brain waves and study heart rhythms. And at Scotland Yard, some cutting-edge criminologists are using Macs to view and analyze voiceprints, which depict the characteristics of an individual's voice. Like fingerprints, no two are alike.

Sampling Some Technicalities

To understand how the Mac records and plays back sound, think of a movie. By taking 24 photographs per second, a movie camera captures a reasonably accurate sampling of the action in front of it. When those samples are played back, the illusion of smooth motion is created.

Digital audio recording

Digital audio also samples motion, like the moving air molecules that make up sounds. Vibrating objects — whether strings, saxophone reeds, vocal chords, or slamming car doors — produce *sound waves*, variations in air pressure that travel outward from the sound source like the ripples from a stone dropped into a pond.

A digital audio recorder samples these sound waves thousands of times per second. Each sample is a digital image of the sound at a given instant (see Figure 22-7 "Snapshots of Sound"). The samples, each recorded as a series of bits, are stored in memory and can be manipulated. Bits can be added or removed, their order can be altered, or their very values changed. Each modification alters the overall image of the sound wave, so when the samples are played back, you hear a different sound.

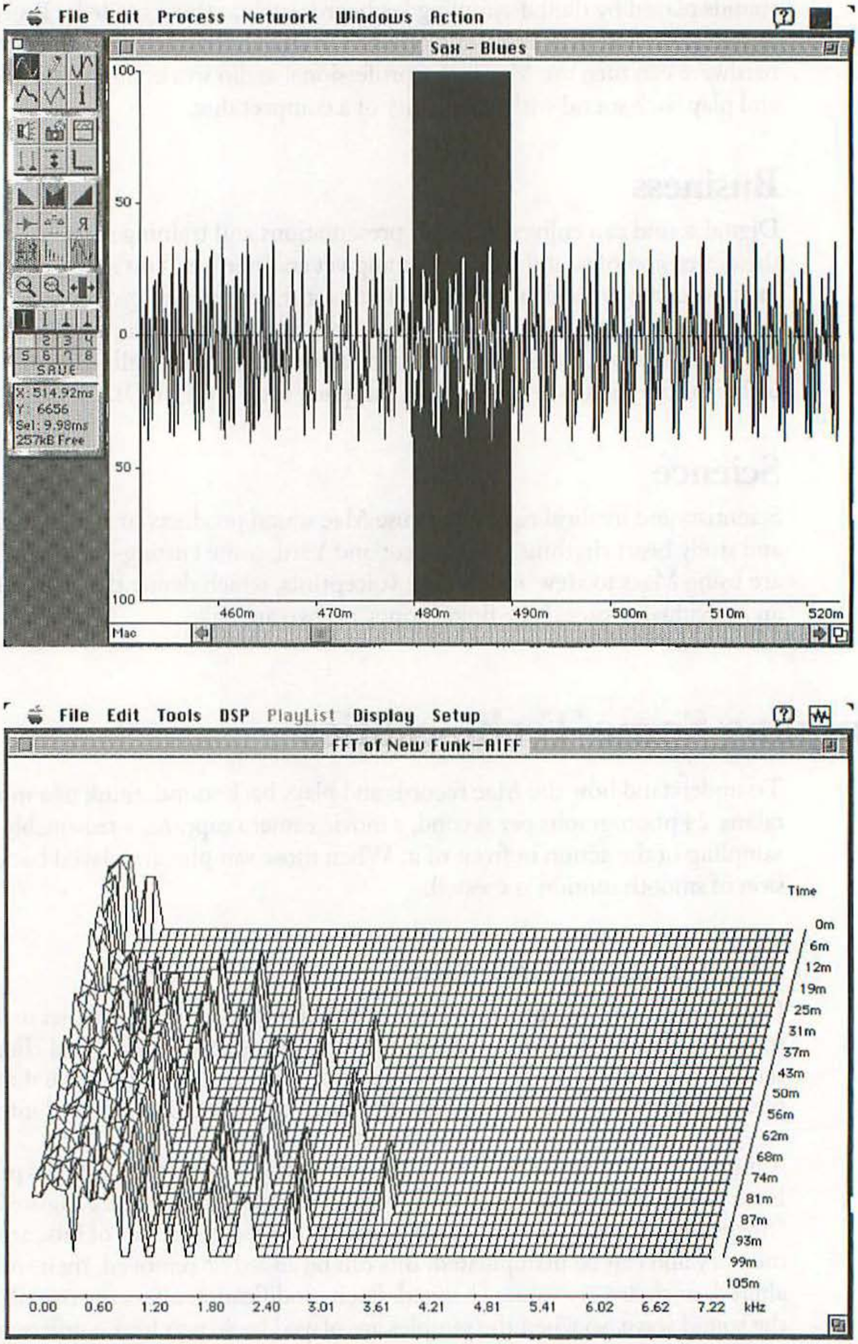


Figure 22-7: Snapshots of Sound Sound-editing programs graphically display sampled sounds and let you edit them. At top, 10 milliseconds of a sampled sound have been selected in Passport Design's Alchemy. At bottom, Digidesign's Sound Designer II depicts how a sound changes over time using a sound-analyzing technique called a fast Fourier transformation, or FFT.

POWERBOOK ANGLE

Being Seen, Not Heard

If you use a PowerBook in meetings, you may want to turn the speaker volume down all the way to avoid annoying colleagues with occasional error beeps — especially if you've customized your beep to sound like The Three Stooges' Curly Howard. But the original PowerBooks have a quirk: If you start up or restart with the speaker volume all the way down, you get a full-volume start-up chord. If you have to restart or start up your PowerBook during a meeting and you don't want to disrupt the proceedings with a start-up chord, insert a miniplug in the PowerBook's audio output jack (on the rear panel) to disable the speaker entirely.

Apple fixed this problem with the PowerBook Duo line as well as the PowerBook 160, 180, and later models. If you choose the Simple Beep sound and turn the volume down all the way, the PowerBook starts up without a peep.

Sampling rates and resolution

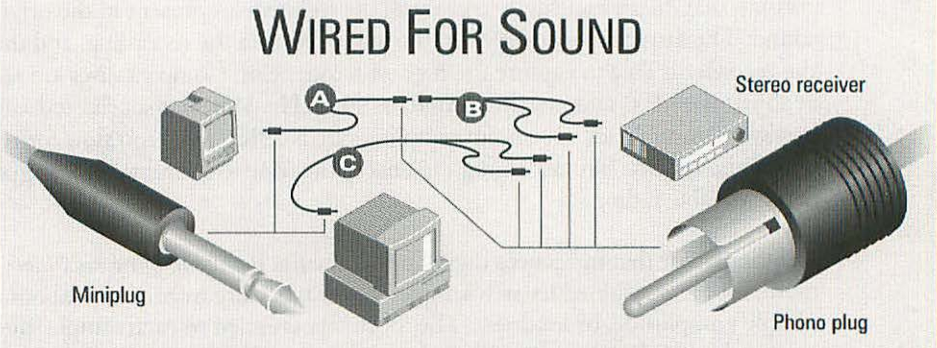
With movies, taking too few pictures per second results in jittery, unrealistic motion. With sound, taking too few samples per second results in a distorted recording that doesn't faithfully convey all the frequencies present in the original sound. The faster the *sampling rate*, the more accurate the recording, and the better the recorder is able to capture the highest frequencies. Compact discs are recorded at a rate of 44,100 samples per second, or 44.1KHz. Without specialized sampling hardware, most Macs' maximum sampling rate is 22KHz — too slow for recording-studio quality, but fast enough to enable the Mac to sound at least as good as an ordinary table radio.

Another factor that influences digital sound quality is the *sampling resolution* — the number of bits assigned to each sample. These bits store information about the sample's amplitude, or loudness. The more bits assigned to each sample, the more accurately the recorder can store and recreate the original sound's variations in loudness. A compact disc player (and an AV Mac) has a 16-bit sampling resolution, enabling it to reproduce thousands of distinct volume levels. Non-AV Macs have 8-bit sampling resolution; they re-create only 256 volume levels. When a given sample's amplitude lies between two levels, it's rounded to the nearest one. This rounding of amplitude information, called quantization, causes distortion.

More Required Equipment

Before digitally recorded sound can be played back, the discrete bits of digital data generated during sampling must be translated back into continuously varying volume levels. This job is performed by a hardware component called a *digital-to-analog converter*. Because all Macs contain one, they can play digital sound without additional hardware. For better sound quality, however, you can attach the Mac to a stereo system or external amplifier as shown in Figure 22-8 "Wired for Sound." You might also consider Apple's AudioVision monitor, which contains a pair of great-sounding speakers and provides convenient front-panel controls for adjusting volume. The AudioVision monitor also contains a built-in microphone similar to the one that accompanies an AV Mac.

To record sound, the Mac needs an analog-to-digital converter, which measures the voltage levels coming from a microphone or other sound source and translates them into digital data. Such hardware is built into most current Mac models, which provide a three-conductor audio input jack that supplies power to the microphone. The microphone itself is a sensitive electret condenser microphone not much bigger than a large button. An adapter cable, available separately, lets you connect a stereo and other audio sources, and merges the left and right audio channels into a single channel.



For better sound quality, connect a Mac to a stereo system. For monophonic Macs, one cable has a ⅛-inch miniplug on the Mac end, and a phono plug (Radio Shack catalog number 42-2444) on the other end **(A)**. The other cable is a "Y" adapter with a phono plug on one end and two phono plugs (Radio Shack number 42-2435) on the other **(B)**. For stereo Macs, all you need is a cable with a ⅛-inch stereo miniplug on the Mac end and two phono plugs (Radio Shack number 42-2475) on the other **(C)**. Important: Before turning your stereo on, turn its volume control all the way down and use the Mac's Sound control panel to turn the Mac's speaker volume all the way down. Then turn the stereo on and adjust its volume and the Mac's to a comfortable listening level.

Figure 22-8: Wired for Sound

In System 6.0.7 and later versions, the Mac's Sound Manager (the portion of the Toolbox that handles audio recording and playback) also offers a compression feature that decreases storage requirements (and fidelity) by assigning fewer bits to each sample. Called Macintosh Audio Compression and Expansion (MACE) scheme, it enables sound to be compressed by 3:1 or 6:1 ratios.

The Sound control panel lets you record your own beep sounds. When you click its Add button, a recording dialog box appears that lets you choose the desired recording settings and adjust the record volume (see Figure 22-9 "Now Recording"). The Mac's Clipboard also supports sound, so you can cut and paste sounds between applications that support it.

Although the input circuitry in most Macs supports monophonic recording only, stereo recording is possible by combining the built-in microphone with Macromedia's MacRecorder Sound System Pro — the most popular third-party recording hardware for the Mac.

Recording CD-quality sound with an AV Mac

An AV Mac such as a Centris 660AV or Quadra 840AV can record and play back CD-quality audio with no additional hardware. An AV Mac contains an analog-to-digital converter as well as an audio input jack that accommodates a microphone or other audio source. If your AV Mac has a CD-ROM drive, you can use the Sound control panel to record audio directly from a compact disc (see Figure 22-9 "Now Recording").

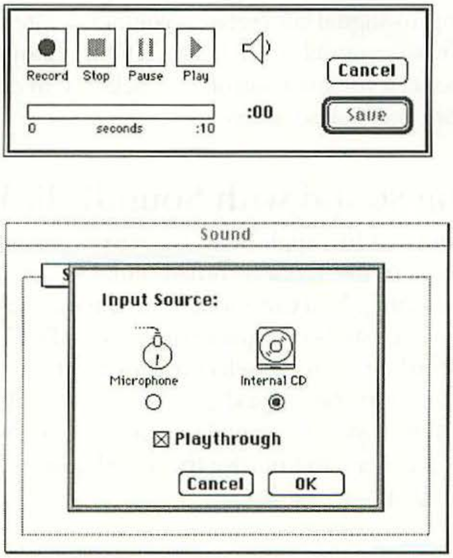


Figure 22-9: Now Recording The Sound control panel lets you record your own error beeps. Recording begins when you click the Record button, and its progress is indicated by the graph and seconds display below the speaker icon (top). When you've finished recording, you can click the Save button to name and save the sound. The Sound control panel that accompanies an AV Mac also lets you specify whether you want to record from the microphone or a CD (bottom).

The AV Macs include a microphone specially designed for PlainTalk speech recognition (described in Chapter 34). Technically, the microphone has a unidirectional pickup pattern with noise-cancelling features. This means the microphone does not pick up sounds that aren't coming from directly in front of it — an important feature for speech recognition. (You don't want a colleague's yelling "I quit!" to cause your favorite program to do the same.) The new microphone also works with the Color Classic but not with other existing Macs, nor does the microphone that comes with other Macs work on an AV Mac.

Other factors besides sampling resolution and rate influence sound quality — just because a computer supports 16-bit, 44KHz sampling doesn't necessarily mean it's a professional-level digital audio recorder. According to Apple, an AV Mac has a signal-to-noise ratio of 85 decibels (db). A CD player's S/N ratio is about 90 to 95 db — only slightly better. (For comparison's sake, a stereo cassette deck's S/N ratio is about 60 db.) So to produce final masters, a recording studio may still prefer to use a high-end digital audio system such as those offered by Digidesign. But if you're a musician producing your own CD, you'll probably be more than satisfied with the audio from an AV Mac. Note that a program developed before the AV Macs' release may not support the machines' recording features. Generally, any program that supports Sound Manager 3.0 (which the AV Macs use) will work. (SoundEdit Pro versions 1.0.5 and later are AV-compatible, as are Adobe Premiere 3 and OSC's Deck, both discussed later in this chapter.)

The MacRecorder Sound System Pro

The MacRecorder hardware is a box slightly larger than a cigarette pack. Besides the analog-to-digital converter, it contains a filter that removes high frequencies that can't be accurately sampled at 22KHz. Completing the package are a small microphone, a volume control, and jacks for an external microphone, tape recorder, or other sound source.

Editing sound with SoundEdit Pro

The SoundEdit Pro application is your primary link to the MacRecorder hardware. SoundEdit Pro displays a recorded sound as a waveform (see Figure 22-10 "Riding the Waveform"). You can zoom in on the waveform display to look at an individual cycle (one back-and-forth phase of the sound's vibration), or zoom out to see the entire recording. You can select part or all of the waveform and cut or copy it to the Clipboard to rearrange the notes in a musical passage or the words in a phrase. You can also modify the sound, adding reverb to simulate a concert hall, or filtering certain frequencies to improve the sound quality. You can even reverse the sound to make it play backwards.

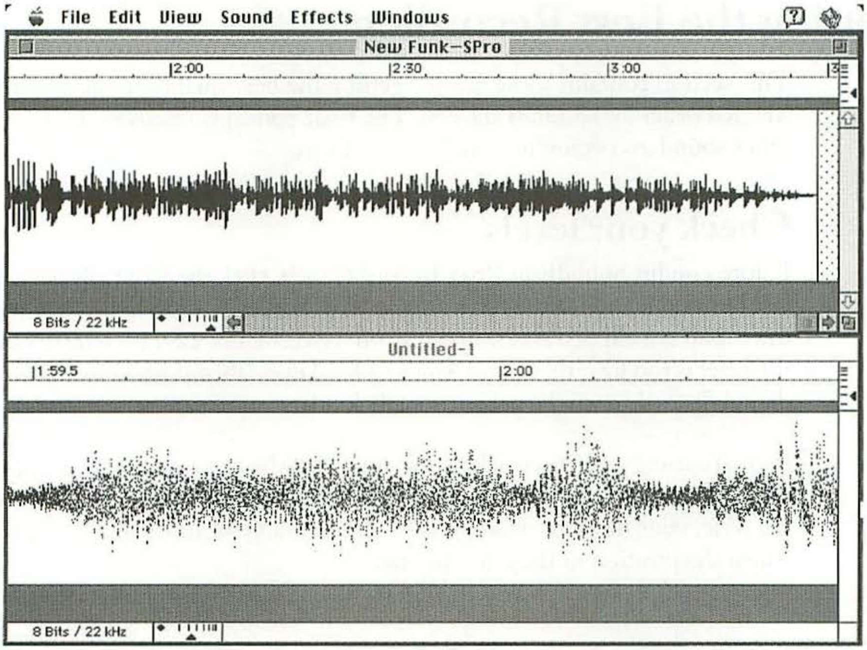


Figure 22-10: Riding the Waveform The graphic display of a sound is called its waveform. Here are two waveform displays of the same sound, displayed by SoundEdit (part of Farallon Computing's MacRecorder package). The top window shows the entire recording; the bottom shows a small portion of it.

The MacRecorder also includes a system extension that lets you use the enhanced sound features in System 6.0.7 and later. With the MacRecorder hardware and driver software installed, your older Mac can act as if it came with a microphone and sound-input circuitry.

Recording in stereo

With two MacRecorders you can record in stereo. (In theory, you can record in stereo with one MacRecorder by recording each channel separately, but synchronizing the channels is difficult.) You can play back stereo sounds on any Mac with stereo playback features — a list that includes the SE/30, the LC520, the Mac II family, the Quadra family, and the Centris family.

But be forewarned that digital sound devours disk space. With a 22KHz sampling rate, one second of sound uses 22K of memory and the same amount of disk space (double that for stereo). When you're willing to trade fidelity for longer recording times, SoundEdit lets you specify sampling rates of 11, 7, and 5KHz as well as one of several compression ratios.

Getting the Best Recording

This section contains some tips for getting the best-quality results from a MacRecorder and SoundEdit Pro. The basic concepts discussed here apply to other sound-recording hardware and software.

Check your levels

Before you hit SoundEdit Pro's Record button, click the Controls palette's level test button and adjust the recording level. If the level is too high, loud portions of the sound are clipped and sound distorted (see Figure 22-11 "Setting Levels"). If the level is too low, the sound won't be loud enough and background noise and any digital distortion will be proportionally louder.

If you're using a MacRecorder, you can adjust the recording level using the volume knob. You can't adjust the level if you're using the microphone that accompanied the Mac; your narrator needs to speak more loudly or more quietly, or you need to adjust the position of the microphone.

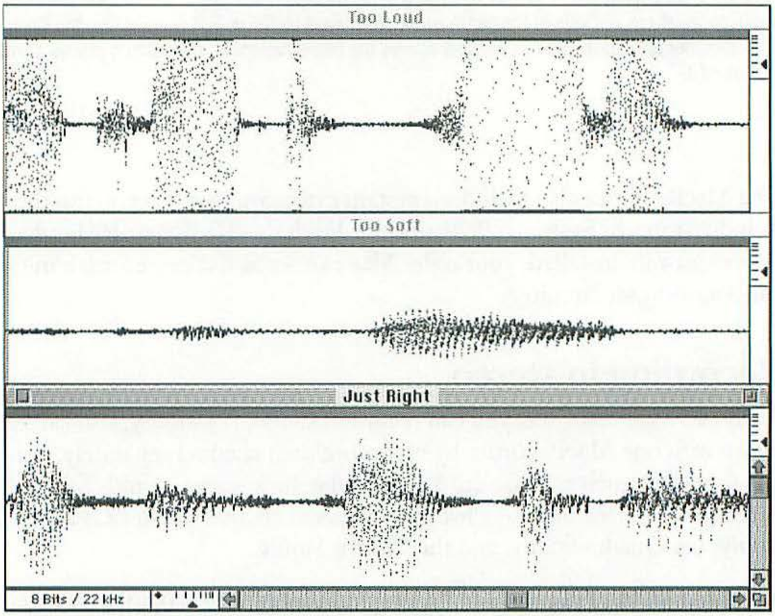
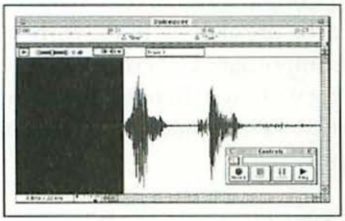


Figure 22-11: Setting Levels The sound in the top window was recorded at too high a volume setting: Note how the waveform seems to crash into the upper and lower edges of the display. The sound in the middle window is too quiet: Notice that the loudest portions of the waveform aren't that much louder than the background noise. The sound in the bottom window was properly recorded: The waveform peaks almost reach the top and bottom of the display.

STEP-BY-STEP

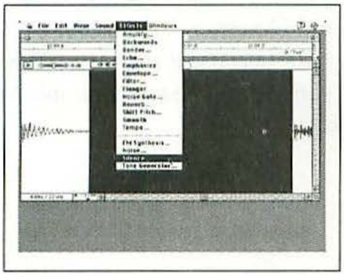
Editing Sound

After recording, you can not only save disk space by removing silences between sounds, but you can remove silences to adjust sounds so they begin where they should.



To remove a silence:

1. **Select the appropriate region.**
   (In this example, roughly one second of silence has been selected in Macromedia's SoundEdit Pro.)
2. **Press the Delete key.**
   Silence is as hard for the Mac to reproduce as sound. In the following example, note the slight waviness in the selected passage. When played, it sounds like static.



To fix the problem:

1. **Select the portion that should be silent.**
2. **Choose SoundEdit's Silence command.**
   For smooth results, you may want to use the Envelope command to introduce a brief fade out and fade in on either side of the silence.

Speaking of microphone positioning, locate yours at least a few inches from the narrator's mouth to avoid breathy results. As a test, record the phrase "pretty poppies." If the result sounds like a hurricane, back off. Finally, move as far away from the Mac as possible to avoid recording hard disk and fan noise. If you're still picking up Mac noise, consider turning the Mac off and using a high-quality audio tape recorder to make the recording. Then connect the recorder's line-output jacks to your Mac or MacRecorder and digitize the results.

The Formats of Sound

Every program category has its standard file formats, and sound-editing software is no exception. Although the SoundEdit application has its own file format, it also supports two important standard formats — SND resources (also known as *sound* or 'snd' resources) and Audio Interchange File Format.

If there's a sound you want to use as a system-error beep in a HyperCard stack, you must save it as an SND resource. Technically, two types of SND resources exist. Format 1 resources are generally system beeps, and Format 2 resources are used by HyperCard and other sound-playing applications. (Historical note: In the early days of digital Mac sound, the distinction was more important; you couldn't use Format 2 SND resources as system beeps. Beginning with System 6.0.2, however, Apple made the Mac's Sound Manager a bit less picky. With System 6.0.2 and later versions, you can use either format for system beeps.)

The Audio Interchange File Format (commonly referred to as either AIFF or Audio IFF) lets one program open a digital recording created by another program. You can find support for AIFF files in professionally oriented sound software such as Passport Designs' Alchemy and Digidesign's Sound Designer. AIFF is a preferred format for swapping files between such programs because it supports stereo recordings and 16-bit sampling resolution; SND resources can be stereophonic or monophonic, but they support only 8-bit resolution.

Sound at the High End

MacRecorder and the microphone that accompanies most Macs aren't intended for professional audio applications. If you don't have an AV Mac and you want to reach the upper strata of Mac digital audio, you need more sophisticated hardware such as Digidesign's Audiomedia II board, which is compatible with most NuBus-equipped Macs. Audiomedia II contains a Motorola digital signal processing chip, a microprocessor designed for the data-shuffling demands of digital audio. (Audiomedia LC, a version of the board for the Mac LC family of machines, is also available.)

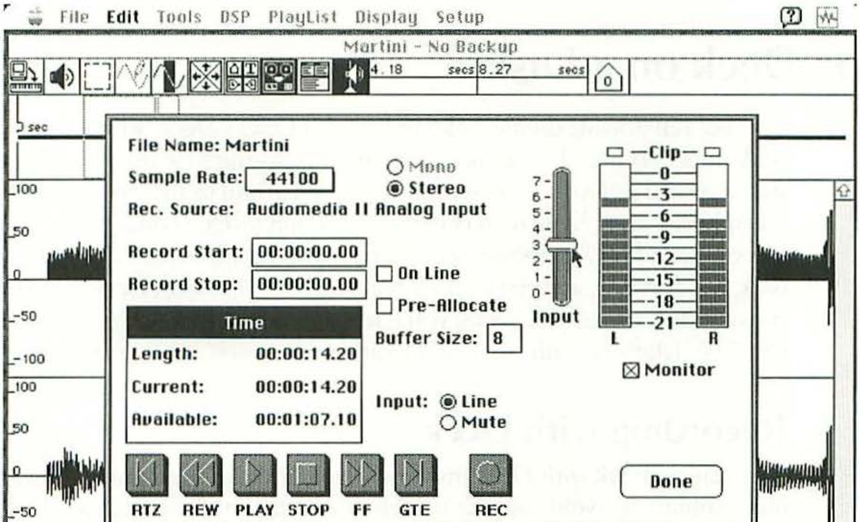
CD-quality stereo

The Audiomedia II board enables the Mac to record and play back stereo CD-quality audio directly to and from a Mac's hard disk. Thus, sound length is limited only by available disk space. You still may feel rather limited, however: A one-minute monophonic recording uses 10MB of disk space; double that for stereo.

On the back of the Audiomedia II board are a microphone jack and six RCA jacks. Two are inputs that accept audio from a tape deck, compact disc player, or other sound source. Audiomedia II can record from the RCA and microphone jacks simultaneously, enabling you to record a voice narration and background music in one step. Two RCA jacks are outputs that send an analog signal to a stereo amplifier or mixer, and the remaining two are digital outputs (S/PDIF-type) that can connect to a digital audio tape recorder.

Audiomedia and hard drives

Audiomedia II includes Digidesign's Sound Designer II, which you use to record, alter, and play back recordings. Each recording, or sound file, appears in its own window (see Figure 22-12 "In the Studio"). While recording, Sound Designer II expertly shuttles incoming data from the Mac's memory to your hard disk — provided the hard disk has a 28ms or faster average access time. If the disk isn't fast enough, parts of the recording will be lost, and you'll need to try again with a slower sampling rate. (If you want to use the Audiomedia II board with a sequencer such as Digital Performer or Studio Vision, you need an 18ms or faster drive. Most of today's high-capacity hard drives meet this requirement; Audiomedia II's manual also includes a list of recommended drives.)



File Name: Martini

Sample Rate: 44100

○ Mono

● Stereo

Rec. Source: Audiomedia II Analog Input

Record Start: 00:00:00.00

Record Stop: 00:00:00.00

☐ On Line

☐ Pre-Allocate

Buffer Size: 8

☒ Monitor

Time	
Length:	00:00:14.20
Current:	00:00:14.20
Available:	00:01:07.10

Input: ● Line ○ Mute

Figure 22-12: In the Studio Audiomedia's record window has a volume slider and dancing volume meters that let you adjust the input volume before recording. Familiar-looking "tape transport" controls let you record, rewind, fast-forward, and play back the recording.

Cutting, pasting, and moving sounds

Sound Designer II's editing features enable you to cut and paste portions of a recording. You can also alter individual sound samples using a MacPaint-like pencil icon. To locate exact spots on the recording, there's a scrub tool that lets you slowly play the recording forwards and backwards — like rocking the reels of a reel-to-reel tape recorder back and forth.

The remarkable Playlist editing feature lets you rearrange a recording — remove or rearrange words, cut or add verses to a song, or repeat a section — without changing the original sound file. You do so by selecting specific areas of the recording (such as a single verse), naming them, and then arranging those names in the playlist window. Just as a baseball manager can change the batting order by simply rearranging names on the lineup card, you can change how a recording plays back by rearranging names in its playlist window. You can create and save as many playlists as you like.

You can also mix two recordings or fade from one to the other. You can change a recording's tonal qualities using an on-screen graphic equalizer and hear each change as you make it. You can even change a recording's length without altering its pitch — handy if you have a 35-second music passage that has to fit a 30-second animation.

Tape Deck on a Disk

Another remarkable digital audio program is OSC's Deck, which works with an Audiomedia II board or similar hardware to turn the Mac into a four-track digital stereo recorder. Deck's sole screen display is faithful to the multitrack recording metaphor, with volume meters that show sound levels, sliding faders that adjust recording and playback volumes, and transport controls that let you record, play back, fast forward, and rewind (see Figure 22-13 "Now on Deck"). If you've used conventional multitrack decks, you'll feel at home with most of what you see. And you'll be delighted with some of the differences, such as instantaneous rewinding.

Recording with Deck

Recording a track with Deck involves selecting the desired track, adjusting the input volume to avoid clipping (which causes distorted sound), and then clicking the Record button. After you record one track, you can record additional tracks. If you fill all four tracks and still need more, you can merge two or more tracks into one, freeing the others for reuse. This technique, called *bouncing*, is often used with conventional multitrack decks too. But bouncing tracks in the analog world degrades a recording's quality; not so with Deck.

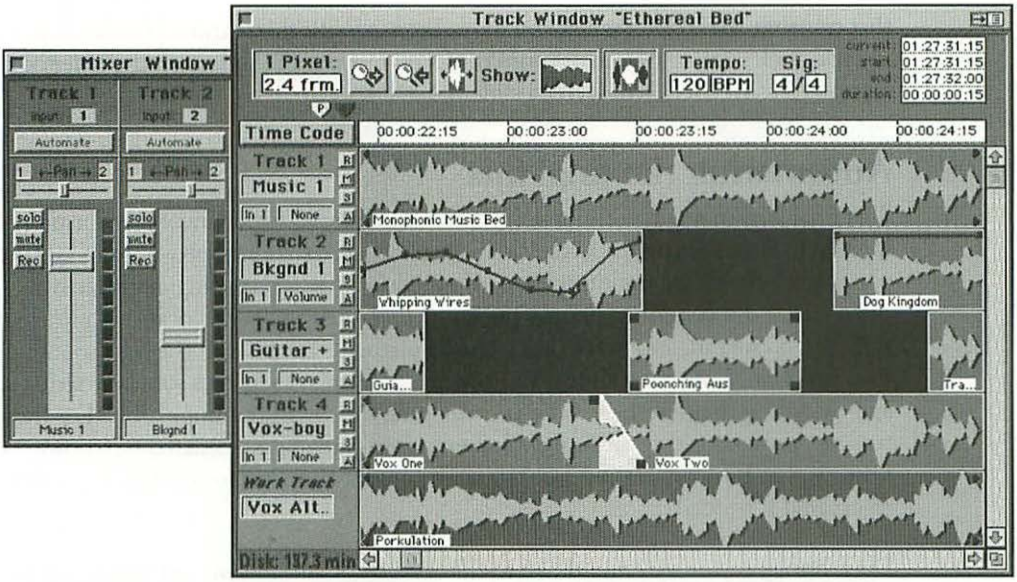


Figure 22-13: Now on Deck OSC's Deck turns the Mac into a multitrack digital audio recorder with automated mix-down features and the ability to import and play back MIDI sequences.

Deck also exploits the digital signal processing features of the Audiomedia II board to enable you to alter the sound of a track during playback. Several digital effects are supported, ranging from a digital equalizer, which lets you accentuate or attenuate certain frequencies, to a stereoizer, which processes a monophonic recording to simulate stereo.

Deck meets MIDI

Another big difference between Deck and conventional recorders is that Deck can import and play back a MIDI composition created using sequencer software. To include a MIDI sequence in a Deck recording, save the sequence as a standard MIDI file, and then import it into Deck. Thereafter, when you play back your audio recording, Deck also plays the sequence, thereby controlling any MIDI instruments attached to your Mac. A musician may use this feature to combine sequenced instrumentals with vocals or acoustic instrumentals. A multimedia producer may use it to add voice narration to an instrumental sound track.

Deck reaches out to the MIDI world in another way: It lets you assign, or map, one or more of Deck's on-screen faders to the physical sliders on a MIDI fader box such as J.L. Cooper Electronics' FaderMaster. (A *fader box* contains slider knobs that transmit MIDI data when you move them.) With this feature, you can control the playback volume of one or more tracks by moving the sliders on the fader box instead of using Deck's on-screen sliders.

Automating the final mix

The final step in any recording session is the *mix-down,* which involves adjusting the playback volume of each track while recording in standard two-track stereo on a second deck. As the multitrack recording plays back, a recording engineer will often adjust the volume of certain tracks, change their apparent location in the left-right stereo spread, and make other fine adjustments to arrive at the best-sounding final product. Twiddling all those knobs as a piece plays requires some dexterity, and twiddling them in the exact same way each time is all but impossible. For these reasons, professional recording equipment often provides automated mix-down features that remember the adjustments the engineer makes so the final mix can be re-created if needed.

Deck brings automated mix-down to the desktop. You can save and restore up to 200 different combinations of fader and effects settings. During playback, Deck's faders and other on-screen knobs move to the appropriate positions by themselves. Automation files are stored separately from the recording itself, enabling you to apply different automation files to a single recording to see which you prefer.

It's also worth noting that you can move recording files between Deck and Digidesign's Sound Designer II software. Deck can also work with AIFF files.

Sound at the Summit

At the summit of the Macintosh digital audio world, you can find products such as Digidesign's Pro Tools system, which you can use to record and edit CD-quality digital audio, synchronize to motion picture and videotape sound tracks, and use digital audio tape (DAT) to create masters that you send to a compact disc manufacturer for pressing. It's a professional-quality digital audio recording and mastering system, and it runs on a computer that smiles when you switch it on.

Pro Tools comprises a NuBus board containing the DSP chip and its support circuitry, an external box that contains the analog-to-digital converter, circuitry for synchronizing audio to video, and Apogee anti-alias filters to improve sound quality. (Apogee filters are popular in the professional digital audio world.)

Other high-end digital recording products from Digidesign include the Session 8 family. The Session 8 provides 8-track digital recording and is designed for home studios. The Session 8 XL is designed for professional applications and includes the same audio interfaces that ship with Digidesign's Pro Tools and Sound Tools II systems. Both Session 8 models are available for Macs as well as DOS PCs running Microsoft Windows.

Digidesign and Prosonus (a leading developer of sampled sounds for music samplers) have collaborated on a CD-ROM packed full of production music and sound effects designed for audio and multimedia productions. Called Clip Tunes, it contains 350MB of music in a variety of styles and 250MB of sound effects, all in Sound Designer II format. Prosonus also offers Mr. Sound FX, a collection of sounds in SoundEdit Pro format.

Sound and Multimedia Productions

Sound helps put the multi in multimedia. There are several ways to add the dimension of sound to multimedia productions (see Table 22-1). The least expensive technique involves using the Mac's built-in sound circuitry for recording and playback. (A Mac that lacks a microphone requires additional hardware, such as Macromedia's MacRecorder, to record sound.) Most Mac-generated audio isn't of compact disc quality, but played through high-quality speakers, it can sound surprisingly good.

All major presentation, multimedia production, and authoring programs can play sounds. Given that, your choice of a production program depends less on sound and more on the nature of your production. For slide show-style presentations, you will probably choose between Aldus Persuasion or Microsoft PowerPoint.

For interactive, hypertext-oriented projects, you may choose between Claris HyperCard, Aldus SuperCard, or Authorware's Authorware Professional. For video-oriented QuickTime productions, there are programs such as Adobe Premier, Passport Producer, and DiVA VideoShop. For ambitious productions that involve combining animation, titles, QuickTime clips, and multiple soundtracks, you might choose Macromedia's Director, or MediaMaker, or Passport Design's Producer.

The sections that follow show how several popular multimedia presentation and production programs handle sound.

Table 22-1
Ways to Sound Off

Technique	*Pros*	*Cons*	*Tools*
Digitized music clips played through the Mac's sound circuitry	Inexpensive; you can move productions to another Mac without adding hardware	Sound isn't CD quality; digitized clips use up disk space	For older Macs, a MacRecorder; for newer Macs, appropriate cables, optional: a CD-ROM and clip music collection (Macromedia ClipMedia recommended)
Music clips played through Digidesign's Audiomedia II board	CD-quality sound; board can be used to record and mix voice-overs, too; board includes Sound Designer II	Costly; CD-quality stereo sound requires a lot of disk space; sound plays only on Audiomedia II-equipped Macs	Audiomedia II; a CD-ROM drive and Digidesign ClipTunes (SoundDesigner-format production music)
MIDI music sequences played through sound modules	High-quality sound; MIDI sequences use very little disk space	More hardware to buy and transport; must use Apple MIDI Manager in most production programs	MIDI sound module (see text); MIDI interface; amplification system: clip music collection (Opcode MIDIClips; Passport Music Data Company; also on-line services and user groups)
Conventional CD audio played through CD-ROM drive under control of Passport Producer	You can play tracks from any audio CD, in any order. CD audio uses no disk space.	Potential copyright problems; limited control over audio	Passport Producer; CD-ROM drive; any audio CD
Conventional CD audio played through a CD-ROM drive under control of a HyperCard stack and The Voyager Company's CD AudioStack software	You can play tracks from any CD, in any order; you can create interactive stacks that play passages when buttons are clicked or that display running comments during playback; CD audio uses no disk space	You must work in HyperCard — not always the ideal multimedia production tool	Voyager CD AudioStack software; CD-ROM drive; HyperCard; any audio CD

Sound and Aldus Persuasion

The voice-over is a common device: A graph or other image appears while a voice elaborates on it. You can apply this technique to simple presentations created with Aldus Persuasion.

Persuasion 2.1 and later versions support sound via QuickTime, so you must convert the AIFF files into QuickTime movies using Apple's Movie Converter utility. Next, open the presentation and import the QuickTime movie: In Persuasion, use the Import command. To play the movie automatically when its slide appears, choose Preferences from Persuasion's File menu and check the Play Movies box.

You can also add sound to Microsoft PowerPoint presentations using similar techniques.

Sound and Macromedia Director

Director provides two sound channels, so you can put background music in one channel and a voice-over in the other.

Director provides a few ways to import sound. You can use Director's Import command to add a sound to the Cast window, and then drag the sound from the Cast window to the desired sound channel in the Score window. If you will use a sound in several Director productions, you can save memory and disk space by adding the sound to a shared cast movie as described in Director's documentation. You can also install sound resources in Director's Sound file; this option is best for sound effects and other short sounds.

When you start playing sounds in one channel and then introduce a sound from the second channel, the volume of the first channel drops by about half. If you want the volume of both sound channels to be the same throughout the movie, put Director's *null sound* in all the consecutive empty sound channel cells that precede the second channel's sound. You can also control the volume of each channel using Director's Lingo scripting language.

QuickTime Talkies

For many of today's multimedia producers, QuickTime is where the action is. Unfortunately, synchronization of sound and video tracks is often poor — QuickTime talkies often look like English-dubbed foreign films. This problem occurs because QuickTime concentrates first on playing sound without distracting interruptions, and discards video frames when necessary in an attempt to maintain synchronization. Another problem: If a QuickTime movie starts with a sharp, percussive note, part of the note is often cut off during playback.

But QuickTime's handling of sound will improve as QuickTime and the Mac family evolve. With this rosier future in mind, here's a look at the issues and options behind working with soundtracks in the most popular video-editing program.

Sound and Adobe Premiere

Premiere can record audio and video simultaneously if you have a Mac equipped with sound-input hardware. You can also record voice-overs and music within Premiere, using the Sound Settings dialog box to adjust levels and choose sampling rates. However, it's often easier to use SoundEdit Pro, which is faster and has better editing features. If you use SoundEdit Pro, save the sound in AIFF format and use Premiere's Import command to bring it into the Project window. Then drag the sound to the Construction window.

Premiere has multiple sound channels and excellent mixing features (see Figure 22-14 "Sound and Premiere"). Each audio clip has a fade control; to adjust the level of an audio track, drag its fade control up or down. You may start a movie with a music score playing at full volume, and then fade the music to 50 percent volume as

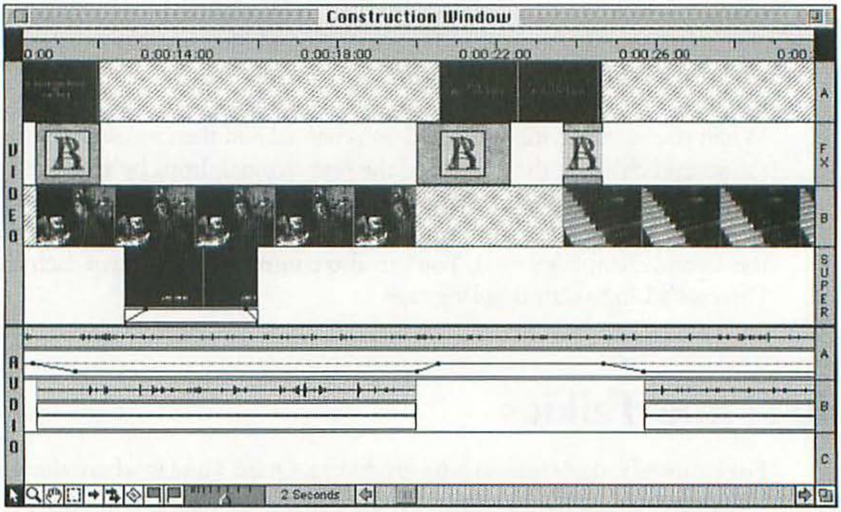


Figure 22-14: Sound and Premiere Adobe Premiere lets you adjust the level of audio tracks. Here, a music score in Track A is faded to 40 percent of its normal volume as a narration begins in Track B. When the narration ends, the music resumes its normal volume, and then fades again as the next voice-over begins.

a voice-over or talking head begins speaking. You can perform similar volume adjustments using SoundEdit Pro's Envelope dialog box. (***Tip:*** For faster Premiere performance, use the Preferences command to turn on the audio approximation feature.)

Adobe Premiere 3 features (among other things) improved sound features. Premiere 3 lets you zoom in to edit sound at a resolution of 1/600 second. Premiere 3 also supports Apple's Sound Manager 3.0, which enables programs to record and play CD-quality audio on an AV Mac or other Mac equipped with appropriate third-party hardware.

Now Hear This

At present, digital audio requires too much memory and disk space to be practical for many applications that could benefit from it. A talking tutorial that explains a program's features may be valuable, but are you willing to donate half your hard disk to it?

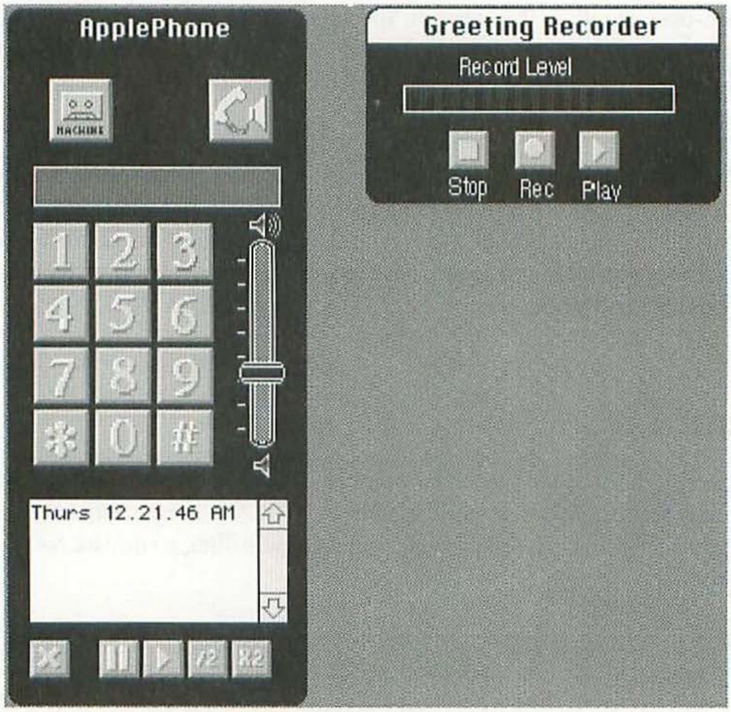
Despite the storage crunch, sound is working its way into more types of applications. Several electronic mail packages let you send voice-mail messages to other users on a network. The Microsoft Word and MacWrite Pro word processors let you annotate documents with spoken comments.

Sound is potentially useful for electronic mail, but I question its value for document annotation. For one thing, many people feel self-conscious about speaking into a microphone. For another, sounds require more time to transmit over a network than does text, and they devour disk space and memory. And finally, opening and playing back recorded annotations requires more effort than simply reading text.

Apple's AV Macs not only provide CD-quality sound without additional hardware, they also bring new audio applications to mainstream business. Plugging a GeoPort Telecom Adaptor into your AV Mac turns the computer into a telephone and answering machine (see Figure 22-15 "Calling ApplePhone").

In the future, you're likely to see even more sophisticated applications of digital sound. Soon, you may protect sensitive documents with a password utility that recognizes only your voiceprint. Or you may enjoy stereo sound effects in your quest to save the galaxy.

In other words, the Mac's audio features are impressive now, but we haven't heard anything yet.



Thurs 12.21.46 AM

Figure 22-15: Calling ApplePhone The ApplePhone application lets you use an AV Mac as a telephone and digital answering machine. The /2 and X2 buttons provide a convenience no conventional answering machine can match: They slow down or speed up message playback *without* changing its pitch.

CHAPTER 22 CONCEPTS AND TERMS

- The Mac can perform many musical roles, including sequencing (recording, editing, and playing back performances); scoring (putting notes on paper); composition (analyzing phrases and generating new ones); sound and patch editing (manipulating an instrument's sounds); and soundtrack production.
- Programs such as Concertware Pro, Jam Session, and Super Studio Session let you experiment with music and sound with little additional equipment.
- The Musical Instrument Digital Interface (MIDI) was developed to let musicians connect electronic instruments to each other and to computers. MIDI lets you create a network of two or more instruments that you can play from one instrument. MIDI also lets you combine a computer-controlled network of instruments with audio equipment and even stage lighting to automate an entire performance.
- MIDI sequencer programs let you build arrangements by recording parts one track at a time. Scoring programs let you print music using conventional music notation; many programs can transcribe music as you play it on a MIDI keyboard. Patch librarians let you manage, alter, and save a MIDI instrument's sounds by manipulating system-exclusive MIDI data.
- The Mac's ability to record, manipulate, and play back sounds has opened doors to new applications in education, entertainment, music, business, and science.
- To digitally record audio, thousands of samples must be taken per second. Compact discs use a 44.1KHz sampling rate; Macs can sample at this rate when equipped with hardware such as a Digidesign Audiomedia II board. The AV Macs can also sample at 44.1KHz. Other Macs are limited to a 22KHz sampling rate.
- The most popular program for working with sound on the Mac is Macromedia's SoundEdit Pro. Professional-level sound-editing programs include Digidesign's Sound Designer II and Passport Design's Alchemy.
- Most multimedia authoring and production programs support digital sound resources as well as MIDI and compact disc audio.

analog-to-digital converter
A circuit, essential for digital audio recording, that turns a continuously varying (analog) sound wave into a series of numbers that the Mac can store, manipulate, and play back.

Audio Interchange File Format
Abbreviated *AIFF*, a standard file format for storing digital recordings.

channels
Electronic mailing addresses that accompany MIDI data and specify its destination. The MIDI standard provides 16 channels.

clipping
The undesirable outcome of recording at too high a volume level. A digital recording in which some samples have been clipped often sounds distorted.

conductor track
A special sequencer track that stores tempo information and lets you vary the tempo within a piece.

continuous data
MIDI data that generally modifies the way a sound is played. For example, many instruments have *pitch bend* wheels or levers that let you slide between pitches the way guitar players do when they bend a string. Another kind of continuous data is *aftertouch*, which describes how hard a note key is being held down.

controller
A device that generates MIDI data. Controllers are usually piano-like keyboards, but MIDI guitars and wind controllers are also available.

digital signal processor
Abbreviated *DSP*, a microprocessor designed to manipulate real-time streams of digital data. An AV Mac contains an AT&T 3210 DSP chip; third-party DSP boards such as Digidesign's Audiomedia II often use a Motorola DSP chip.

digital-to-analog converter
A hardware circuit that translates digital data such as samples into analog signals such as sound waves.

envelope
A graphical depiction of a sound's percussiveness.

event list editing
A sequencer editing mode that displays a track's contents as a table of MIDI data. It doesn't give you the click-and-drag convenience of graphic editing, but it allows for greater precision. Also see *graphic editing*.

General MIDI
A version of the MIDI standard that establishes a fixed set of 128 patches, organized into 16 families. General MIDI is designed to prevent problems that can occur when you play a sequence created for one model of synthesizer on a different model.

graphic editing
Often called a *piano roll* display, a sequencer editing mode that displays a track's contents on a music staff-like grid, except that notes are shown as horizontal bars, with longer bars representing longer notes. Graphic editing lets you select and drag notes from one position to another using the mouse. Also see *event list editing*.

(continued on the next page)

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layering
Playing multiple instruments simultaneously to obtain a richer sound. MIDI is often used for layering.

MIDI file
A standard file format that lets you move sequences between different sequencers, even ones running on different computers.

MIDI interface
A piece of hardware that connects to the Mac's modem or printer port and provides MIDI In and MIDI Out connectors.

multisampling
A technique employed by most samplers that improves realism by dividing the range of notes the instrument can play into multiple samples, each of which plays a range of only an octave or so. This technique avoids having to transpose a sample too high or low.

multitimbral
Capable of simultaneously producing different types of sounds, such as those of a drum set, piano, and horn section.

omni mode
A MIDI configuration mode in which an instrument responds to data sent on all MIDI channels. Compare with *poly mode.*

patch
One of a synthesizer's sounds, such as a piano or guitar. Patches are named in honor of the pioneering synthesizers of the sixties, whose many sound-generating modules were linked by patch cables like those for a telephone switchboard.patch editor

patch editor
A program that lets you draw and manipulate the waveforms that describe a sound's qualities, and then transfer them to a synthesizer's memory.

patch librarian
A program that serves as a database manager for patches, transferring the settings making up each patch to or from a Macintosh disk and enabling you to name, sort, and organize patches.

poly mode
A MIDI configuration mode in which an instrument responds to data from only certain MIDI channels. Compare with *omni mode.*

program change
A type of MIDI command that instructs an instrument to switch sound — from piano to strings, for example.

quantizing
A sequencer and scoring program feature that moves notes to the nearest note value you specify, essentially correcting for timing errors.

sampled sound
A digitized version of a sound, produced by feeding an audio signal into a hardware circuit called an analog-to-digital converter.

sampling rate
The number of sound samples taken per second. The higher the rate, the better the fidelity of the resulting sound.

sampling resolution
The number of bits assigned to each sample. These bits store information about the sample's *amplitude,* or loudness. The more bits assigned to each sample, the more accurately the recorder can store and re-create the original sound's variations in loudness.

sequencer
A program that turns the Mac into a tapeless tape deck that lets you build your own arrangements by recording parts one track at a time and then plays them using one or more synthesizers attached to the Mac.

SMPTE edit time code
A synchronization system used in the motion picture, television, and recording industries. SMPTE, pronounced *simpty,* stands for Society of Motion Picture and Television Engineers. The SMPTE code is often used to synchronize a musical soundtrack or sound effects to film or videotape, and to synchronize the playback of audio from a tape recorder with a MIDI sequence.

SND resources
A standard resource format for digital sounds. The sounds in your System file are SND resources.

sound module
A box containing sound-generating circuitry and MIDI connectors, but no keyboard.

sound waves
Variations in air pressure that travel outward from the sound source like the ripples from a stone dropped into a pond.

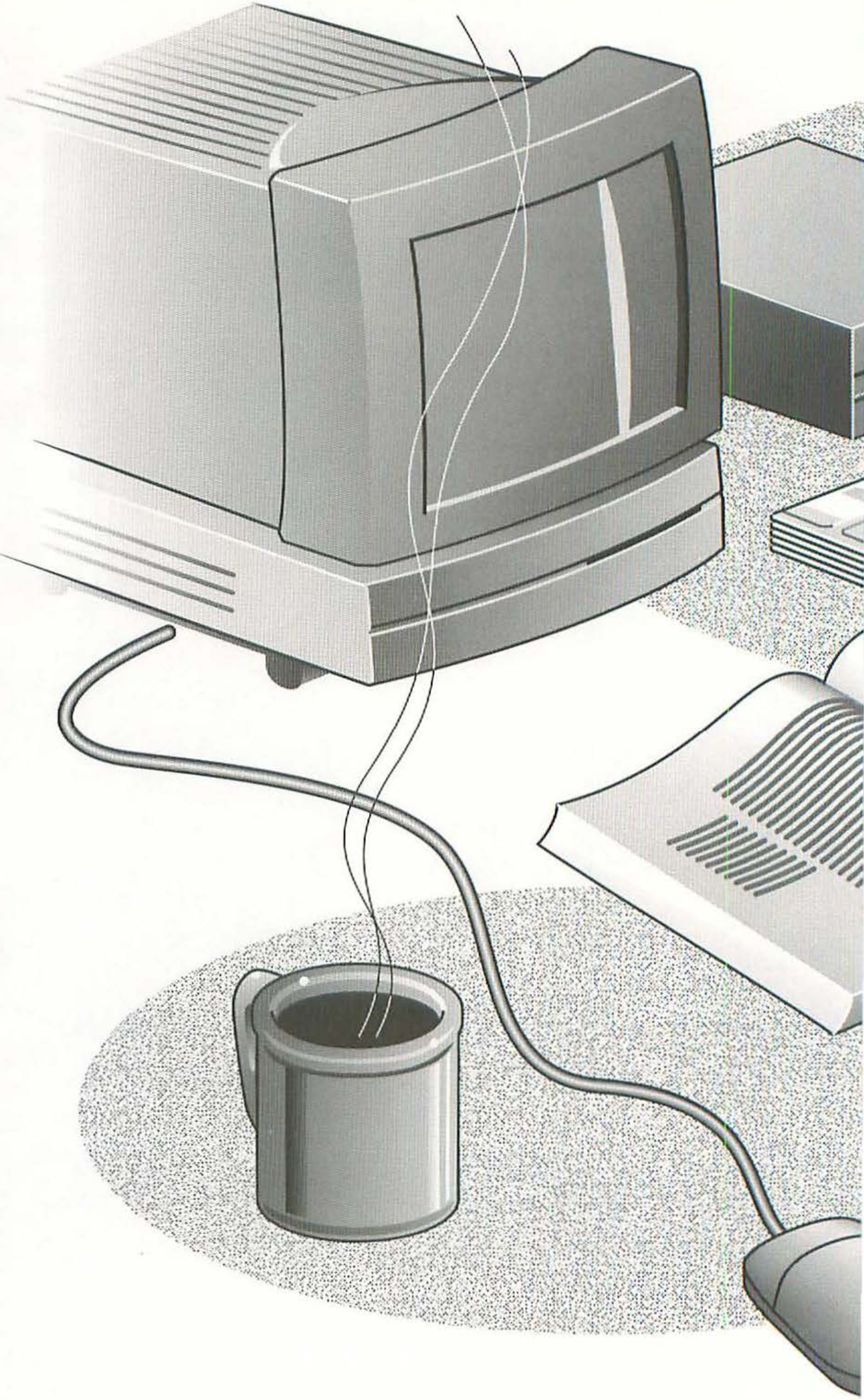
step recording
A sequencer recording mode that lets you manually enter music one note at a time.

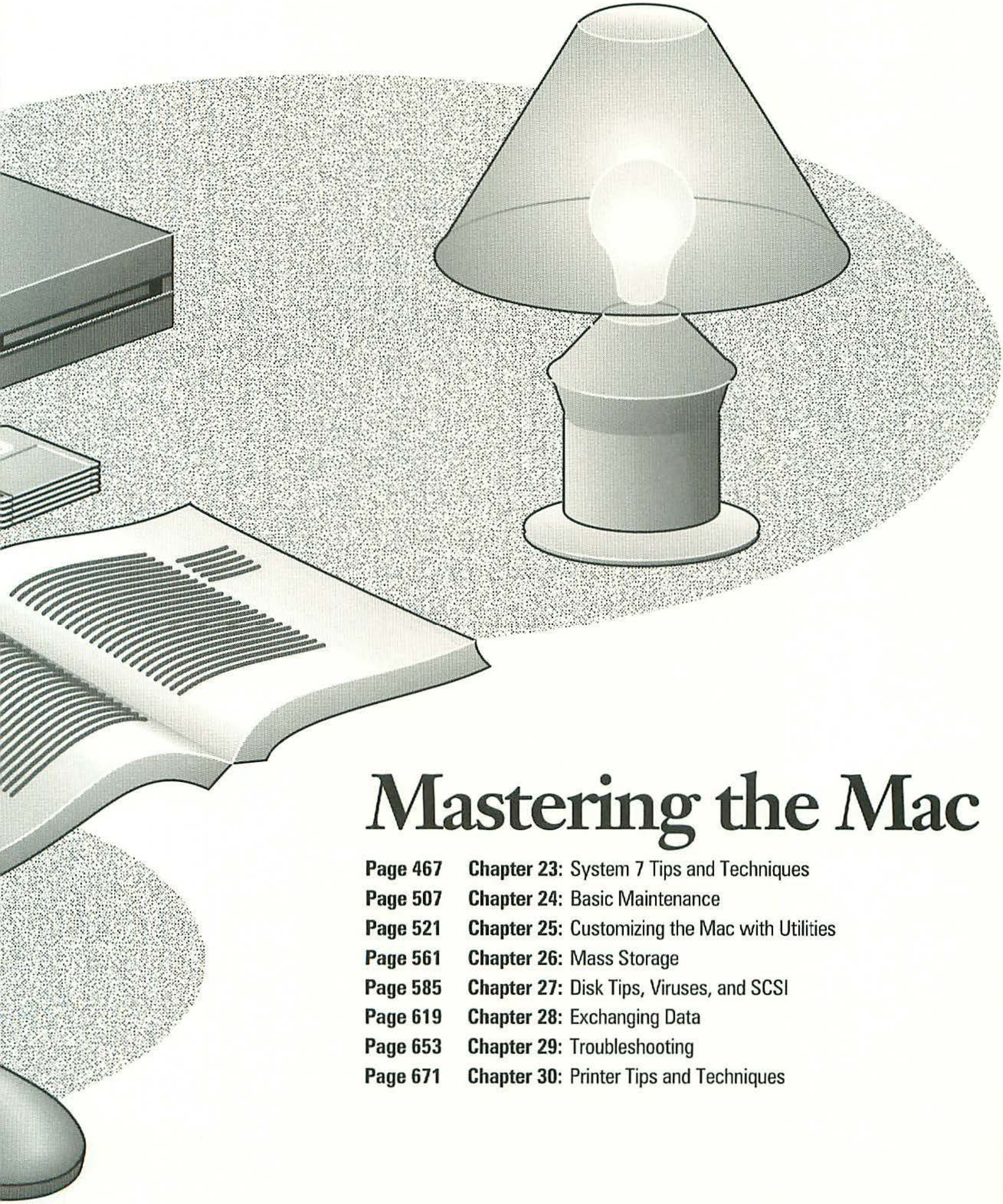
system-exclusive data
MIDI data that is pertinent to a specific model of MIDI instrument, such as the contents of its internal memory or the MIDI-channel assignments of its sounds. By transferring system-exclusive data to the Mac, you can store and alter an instrument's sounds, and then transfer the data back to the MIDI instrument.

universal editor/librarian
A patch editor and librarian that is compatible with numerous instruments. Two popular universal editor/librarians are Opcode's Galaxy and Mark of the Unicorn's Unisyn.

velocity-sensitive keyboard
A synthesizer or sampler keyboard that measures how hard each key is pressed, allowing you to play loudly or softly and enabling the Mac to capture the varied dynamics of a performance.

PART II





Mastering the Mac

Page 467 **Chapter 23:** System 7 Tips and Techniques
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CHAPTER TWENTY-THREE

System 7 Tips and Techniques

IN THIS CHAPTER

- Customizing System 7's Finder to match your tastes and work habits
- Understanding how the Mac and your software use memory
- Adjusting program memory sizes to make best use of your Mac's memory
- Adding fonts in System 7
- Making the most of System 7's multitasking features

One of the beauties of System 7 is that many of its advanced features are tucked beneath the surface, where they don't get in the way of beginners. If you haven't read the System 7 manuals (they're not bad) or one of the 7,438 books that have been written about System 7, you may be missing out on some of its slickest features. In this chapter, I spotlight a few of them. Along the way, I look at some free and shareware utilities that make a good system even better. I wrap up the chapter with a look at System 7's multitasking capabilities — its ability to run multiple programs simultaneously — and provide some strategies to help you take better advantage of them. For an overview of Systemch adds additional features to System 7, see the Late Breaking News addendum at the end of this book.

Making the Transition from System 6

If you've just upgraded to System 7 from System 6 — or if you're thinking of doing so — here are some tips that will make the move less painful. If you're already using System 7, feel free to skip to the section "Becoming Accustomed to Customizing," later in this chapter.

The Open and Save dialog boxes are different

In System 6.x, Open and Save dialog boxes contain a button called Drive that lets you switch between the different disks on your desktop. In System 7, the Drive button is replaced by the Desktop button. When you click Desktop, the list box shows an icon for everything on your desktop — disks, folders, even the Trash (see Figure 23-1 "The Desktop Level"). One benefit of this scheme is that it lets you quickly jump to a particular disk — no more clicking

ON THE CD

- System 7 utilities and dozens of custom icons in The Best of BMUG collection

Drive time after time. Among other things, the dialog box contains a button for creating a new folder.

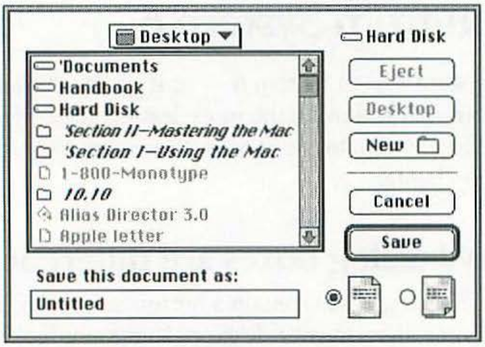
For some shortcuts and tips for System 7 directory dialog boxes, see the Quick Tips box "Dialog Box Shortcuts," later in this chapter.

Master the application menu

In System 7, you don't use the Apple menu to switch to a different open application; you use the Application menu at the right edge of the menu bar instead. Also, because the Application menu is no longer a simple icon, you can't rotate between each running program by clicking it. You can, however, hide the current application by pressing Option while choosing a different application's name (see the Quick Tips box "Finder 7 Shortcuts," later in this chapter).

What's in a rename?

In System 6.x, you can click an icon once and then begin typing to rename it. That is handy, but it also makes it easy to accidentally rename an icon. System 7's Finder makes it more difficult to accidentally rename an icon. To enter the renaming mode, you must click the icon's name (not the icon itself). As an alternative, you can click the icon and then press the Return key. To do everything from the keyboard, select the icon by typing one or more characters, and then press Return to enter renaming mode. Finally, type the new name. Regardless of how you select an icon, you'll always know you can rename it when a box appears around its name.



Save this document as: Untitled

● ○

Figure 23-1: The Desktop Level In System 7, Open and Save dialog boxes do not have a Drive button, as they did in System 6. In its place is the Desktop button, which lets you view the items that are on the Mac's desktop, including disks, folders, documents, and the Trash. To access a different disk, click Desktop and then double-click the disk's name. In this Save dialog box, also note the button for creating a folder and for creating a stationery pad.

System 6 Disks and System 7

Floppy and hard disks that you've used with earlier system versions work with System 7, but when you insert a disk, you'll see a message saying *Updating disk for new system software*. What the Finder is doing is creating a desktop database file that enables it to locate the disk's contents. For high-capacity disks, the desktop database file replaces the DeskTop file, which you've looked at in other chapters. The DeskTop file is still used for disks whose capacity is less than 2MB — in other words, for floppies.

If you use a hard disk or removable high-capacity cartridge with System 7 and then move it to a Mac running System 6.x, you'll notice two new folders: Desktop and Trash. These are folders that Finder 7 creates to store any icons you had moved to the desktop and to store the contents of the Trash. (Yes, under System 7, the Trash is actually a folder — which is why it isn't emptied until you explicitly choose Empty Trash.) You can delete these folders, but Finder 7 will create them again the next time you use that hard disk or cartridge on a Mac running System 7.

New approaches to control panels and extensions

In System 6.x, the Control Panel desk accessory was your gateway to all Control Panel options, including ones with INIT components. In System 7, these items can be scattered throughout a few different folders within the System Folder (see the Quick Tips box "Inside System 7"). You can access them all from one place by creating aliases, however, as described in this chapter.

Inside System 7

The following list describes System 7's new folders and what they contain:

Folder Name	***What it Holds***
Apple Menu Items	Items that appear in Apple menu
Control Panels	Control panels (cdevs)
Extensions	System extensions (INITs, RDEVs)
Fonts	Fonts (this folder not present in System 7.0, which stores fonts in the System file)
Preferences	System and application preferences files
Startup Items	Items you want the Mac to open automatically during startup

System extension loading order

In System 6.x, all INITs live in the System Folder and load alphabetically. In System 7, they still load alphabetically, but from a few different places. First, System 7 alphabetically loads the extensions in the Extensions folder, followed by those in the Control Panels folder, and then those in the top level of the System Folder. You need to keep this loading order in mind when troubleshooting extension conflicts. Also, if you use an extension management utility such as INIT Picker, you must put it in the Extensions folder so that it loads before other extensions.

Easier system resource installation

As I describe in this chapter, you install and remove fonts and sounds by dragging them into and out of the System Folder.

Solving the puzzle

Finally! You can cheat to solve the Puzzle desk accessory. Open the Puzzle, choose Copy from the Edit menu, and then choose Show Clipboard to see the Puzzle's picture intact. You can also customize the Puzzle by pasting a picture into it.

Becoming Accustomed to Customizing

The System 7 Finder — that system program that gives you the desktop with its icons and Trash — provides many more built-in customizing options than did previous Finders. A good first step in conquering System 7 involves tweaking its Finder to fit your tastes and work habits.

Redecorate your directory windows

Using the Views control panel, you can change the type font and size of the text in directory windows and you can choose to see as much or as little information as you like about the items on your disks. Note that unchecking items such as size, date, and kind also eliminates those commands in the View menu. If you uncheck Kind, for example, you won't be able to sort the contents of a window according to icon type (folder, application, document). Other tips: Think twice about checking the Calculate Folder Sizes box; it slows the Finder significantly. If you're a neatnik, check the Always Snap to Grid box. This puts the Finder in what I call *mom mode* — it always cleans up after you.

You can switch between views using the Finder's View menu, but there's a faster way — click the view heading in the active directory window. If you have a large screen, this can be faster than moving the mouse pointer all the way up to the menu bar.

The Finder stores your Views settings in the file named Finder Preferences, stored in the Preferences folder within the System Folder.

Getting rid of the Empty Trash warning dialog box

Normally, the System 7 Finder warns you when you choose the Empty Trash command. If you don't want the warning, you can temporarily bypass it by pressing the Option key while choosing Empty Trash.

You can also get rid of the warning permanently: Select the Trash icon and choose Get Info from the File menu. In the info window, uncheck the Warn Before Emptying box. You'll never see the warning again. (You'll never be rescued by it, either.)

Assigning text labels and colors to icons

Using the Labels control panel, you can create descriptive labels (Personal, Work in Progress, Urgent, To Be Trashed, and so on) and then assign them to files or folders using the Finder's Label menu. You can then use the View menu to sort directory windows according to labels or colors. To be honest, I don't know anyone who uses this feature — maybe you'll be the first.

Customizing the Apple menu

Is there a program, control panel, or document you'd like fast access to? Make an alias of the item (as described later in this chapter) and then move the alias into the Apple Menu Items folder, located within the System Folder. And use a hierarchical

QUICK TIPS

Selecting Icons with the Keyboard

When using the Finder, you can select an icon on the desktop or in the active directory window by quickly typing the first few characters of its name — just as you can select items within an Open or Save dialog box.

If the item you want isn't in the active window, you can still locate and select it from the keyboard — just use the Find command as described in the section "Fast Finding" in this chapter.

You can also select icons by using the keyboard's arrow keys as well as the Tab key and Shift-Tab key sequence. See the Quick Reference card at the front of this book for a list of System 7 Finder shortcuts.

Apple menu utility such as Microseed's HAM, Now Software's Now Utilities, or Alsoft's Menu Extend (part of the Alsoft Power Utilities package). Chapter 25 covers these and other utilities.

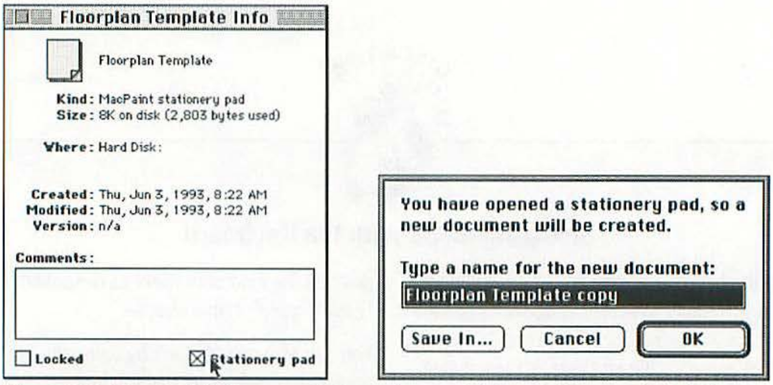
Creating stationery documents

The Get Info window for a document contains a new check box called Stationery Pad. If you check this box, you turn the document into a *stationery pad.* The stationery feature lets you create masters for the types of documents you create — letterheads, business letters, fax cover sheets, newsletter designs, and so on. By creating a document and then turning it into a stationery pad, you can reuse its contents without worrying about accidentally saving over them. When you open a stationery pad, the Finder makes a copy of the document and asks you to name the new copy (see Figure 23-2 "Personal Stationery").

As I describe in Chapter 3, many programs can also save documents as stationery. For details on creating stationery within two popular word processors — Microsoft Word and WordPerfect — see the Chapter 3 Step-by-Step box "Creating Stationery."

Customizing disk, file, and folder icons

When I was a kid, creating custom icons meant a fantastic voyage into Apple's ResEdit resource-editing utility (also discussed in Chapter 25). System 7 makes it easier. Select an icon and choose Get Info. In the info window, click the icon (a border appears around it) and then choose Copy (see Figure 23-3 "Picture an Icon").



Floorplan Template Info

Floorplan Template

Kind: MacPaint stationery pad
Size: 8K on disk (2,803 bytes used)

Where: Hard Disk:

Created: Thu, Jun 3, 1993, 8:22 AM
Modified: Thu, Jun 3, 1993, 8:22 AM
Version: n/a

Comments:

☐ Locked ☒ Stationery pad

You have opened a stationery pad, so a new document will be created.

Type a name for the new document: Floorplan Template copy

Figure 23-2: Personal Stationery To turn a document into a stationery pad, click the Stationery Pad check box in the document's Get Info window (left). When you open a stationery pad, the Finder asks you to provide a name for the new document (right), which will be a copy of the original. To save the document in a different folder or on a different disk, click the Save In button.

QUICK TIPS

Dialog Box Shortcuts

System 7 provides several standard shortcuts for directory dialog boxes. Mastering these shortcuts, which work with any program, can save time when opening or saving files.

Locating a file or folder

To locate a file or folder in an Open dialog box, use the up- or down-arrow keys or quickly type the first few characters of the item's name.

Using Return or Enter to confirm the dialog box

After you locate the file or folder you want, you don't need to reach for the mouse to click the Open button: You can open it by pressing Return or Enter. If you selected a file, pressing Return opens it. If you selected a folder, the Mac opens the folder and displays its contents in the dialog box.

Opening and closing folders

To close a folder and move up one level in the storage hierarchy, press ⌘-up arrow. To open a folder, either select it and press Return as described above, or select it and press ⌘-down arrow.

Moving up one level in the hierarchy

To use the mouse to quickly move up one level in the storage hierarchy, click the disk name that appears in the directory dialog box. Each click moves you one level closer to the desktop level.

Using Tab to switch between the file list and the text-entry box

In the Save or Save As dialog box, you can press the Tab key to switch the keyboard focus between the file list and the text-entry box. When the keyboard focus is on the file list, you can select folders by typing the first few characters of their name; when the keyboard focus is on the text-entry box, you can type a name for the file. By using the Tab key to switch the keyboard focus, you can open a particular folder and then type a document name — without reaching for the mouse. When the keyboard focus is on the file list, a bold border appears around it; when the focus is on the text-entry box, a bold border appears around it.

Quickly accessing the desktop

To quickly jump to the desktop level, simply press ⌘-D or Shift-⌘-up arrow.

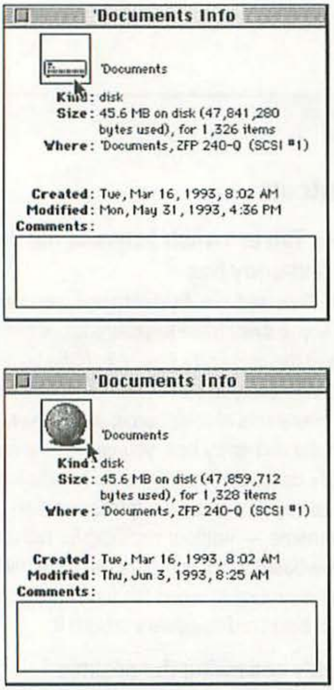
Creating a new folder

You can create a new folder within a currently open folder by pressing ⌘-N.

Canceling the dialog box

If you decide not to open or save a document after all, you can cancel the directory dialog box by pressing ⌘-period (.) or the Esc key instead of clicking the Cancel button.

Now start up a paint program such as Aldus SuperPaint or Adobe Photoshop. Paste the icon, and then use the paint program's tools to tweak it as desired. (Designing a good-looking icon — that's the hard part.) When you're done, select the modified icon and copy it to the Clipboard. Return to the info window from which you copied the icon, be sure the icon is still selected, and then paste.



'Documents
Kind: disk
Size: 45.6 MB on disk (47,841,280 bytes used), for 1,326 items
Where: 'Documents, ZFP 240-Q (SCSI #1)

Created: Tue, Mar 16, 1993, 8:02 AM
Modified: Mon, May 31, 1993, 4:36 PM
Comments:

'Documents
Kind: disk
Size: 45.6 MB on disk (47,859,712 bytes used), for 1,328 items
Where: 'Documents, ZFP 240-Q (SCSI #1)

Created: Tue, Mar 16, 1993, 8:02 AM
Modified: Thu, Jun 3, 1993, 8:25 AM
Comments:

Figure 23-3: Picture an Icon System 7 lets you customize the icons of most items by using the Get Info window. First, select the image in a graphics program and choose Copy. Next, select the icon in the Get Info window; if the icon can be modified, it appears within a rectangle (top). Finally, choose Paste, and the Mac scales the graphic to fit and turns it into an icon (bottom).

You can also use scanned images as icons: When you paste a large image into the info window, the Finder shrinks it to fit a standard icon size. With this technique, you can turn a disk or folder window into a thumbnail catalog of scanned images.

I used custom icons to dress up the folders on the *Macworld Complete Mac CD.* And speaking of the CD, you can find dozens of great-looking custom icons for Apple and third-party equipment in the Utilities folder of The Best of BMUG collection. Using them is a great way to dress up your desktop and also to distinguish between the types of Macs and storage media you use. (For example, you can use the SyQuest icon for your SyQuest cartridges, or one of the PowerBook icons for your PowerBook's hard disk.)

Working with Fonts in System 7

System 7 makes adding fonts to or removing them from your system a breeze. This section shows how to add and remove fonts to or from System 7.0 and 7.1.

Adding a font to System 7.0

Before adding a font, first quit any programs you've already started. (You can't modify the system when programs or desk accessories are running.) Then drag the font file to the System Folder icon. A dialog box appears asking if you want to install the fonts, as shown in Figure 23-4 "Font Moving Made Easy." Click OK or press Return, and the Mac installs the fonts in the System file.

You can also add more than one font at a time by selecting each font file and then dragging it to the System Folder icon.

QUICK TIPS

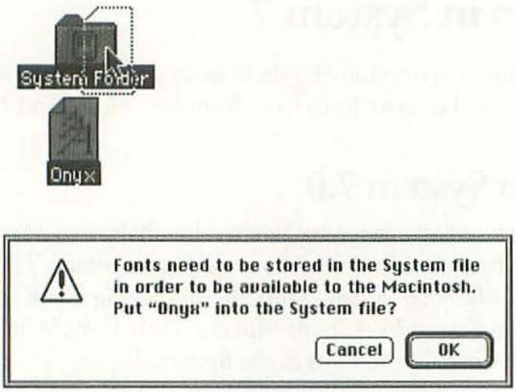
Better Balloons

Most people either love or hate System 7's balloon help feature, which explains menu commands, dialog box options, and tool palette icons when you point to them. The Finder alone contains some 1,300 different help balloons for everything from the Trash can to the One Sided and Two Sided buttons in the Erase Disk dialog box.

One of the less-likable aspects of balloon help is that you must travel up to the menu bar to turn it on — a long journey if you have a big screen. Using a shareware extension called Helium (by Robert Mathews), you can activate balloon help using the keyboard. If the help balloons are a little small for your tastes, you can use Helium to change the font and size in which help text appears.

CE Software's QuicKeys keyboard-enhancement utility also lets you turn balloon help on or off from the keyboard. Open the QuicKeys control panel, pull down the Define menu, open the Extensions submenu, and then choose the System 7 Specials command. In the subsequent dialog box, choose the Toggle Balloon Help option and then type the key sequence you want to use. (I use Control-Help on my extended keyboard, and Control-? on my PowerBook. Note that's Control, not Command [⌘]. You can use ⌘-Help, but some programs may use that sequence themselves. Besides, the Control key is closer to the Help key, making it easier to turn help on or off with one hand.)

By the way, in most cases the text for balloon help is stored in a separate disk file, so you can free up disk space by removing the help file if you like. The Finder's help balloons are stored in a file called Finder Help, located within the System Folder's Extensions folder.



Fonts need to be stored in the System file in order to be available to the Macintosh. Put "Onyx" into the System file?

Figure 23-4: Font Moving Made Easy To install a font in System 7.0, drag its icon to that of the System Folder (top). When the Mac asks if you want to put the fonts in the System file (bottom), click OK. One catch: You must quit any open programs and close any desk accessories in order to install or remove a font.

As alternatives to dragging a font to the System Folder icon, you can also drag it to the System file icon or to the opened System file window. But you can't install a font by dragging it to the open System Folder window. If you try, the Mac simply moves the font into the top level of the System Folder — the font won't be installed in the System file.

Removing fonts in System 7.0

To remove one or more fonts, first quit any open application programs or desk accessories, open the System Folder, and then open the System file. A directory window appears listing the installed fonts. Select the font or fonts you want to remove, and then drag them to the Trash. Better still, drag the fonts to the desktop or to a disk or folder window or icon: You may want to reinstall the fonts later. When you finish removing fonts, close the System file window and the System Folder window.

Adding a PostScript outline font in System 7.0

Adding a PostScript font means performing two steps. After installing the screen font using the techniques I just described, install the printer outline font. (The screen fonts have suitcase icons. Printer font icons vary depending on the font vendor; Adobe's icons have a large *A* on them.) Printer outline font files can go in the top level of the System Folder or in the Extensions folder, within the System

Folder. (The Finder recognizes PostScript outline files. If you drag the outline files to the System Folder icon, the Finder asks if you want to store the files in the Extensions folder.)

Removing a PostScript font from System 7.0

To remove a PostScript font, first remove the bitmap font from the System file using the techniques described earlier, and then remove the PostScript outline font from the Extensions folder.

Adding and Removing Fonts in System 7.1

System 7.1 stores all fonts — whether TrueType, PostScript, or bitmap — within the Fonts folder (located within the System Folder). This makes adding and removing fonts easier and faster than with System 7.0.

Adding a font in System 7.1

To add a font, drag the font file to the System Folder icon. A dialog box appears asking if you want to install the fonts in the Fonts folder. If any programs or desk accessories are open, a second dialog box appears telling you that the font will not appear in the currently running programs: You'll need to quit the programs and start them again (you don't have to restart the Mac). Click OK or press Return. The Mac installs the fonts in the Fonts folder.

Removing a font in System 7.1

To remove a font, first quit any programs or desk accessories that you previously started. Then open the Fonts folder and drag the font out of the folder. Or simply use the Finder's Find command to locate the font for you.

The Amazing Alias

One of System 7's biggest conveniences is the *alias*. An alias is a small file that acts as a remote control for another item, usually another file or a folder. When you double-click an alias, the Mac opens the item that the alias points to. This lets you keep programs and files within their folders but still have fast access to them from other places, such as the desktop (see Figure 23-5 "Decked-Out Desktop").

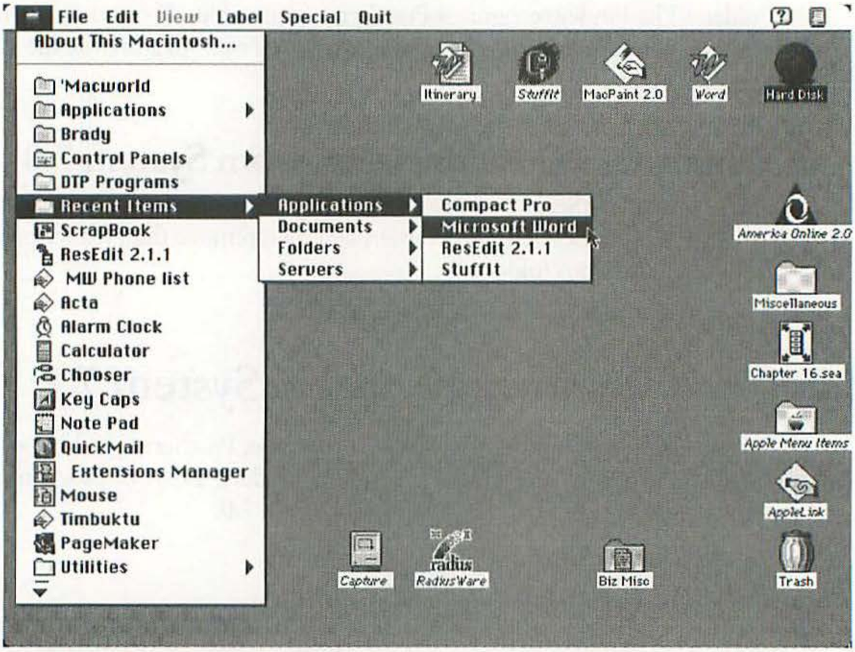


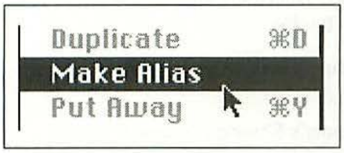
Figure 23-5: Decked-Out Desktop By placing aliases of often-used files, folders, and programs on your desktop, you can have fast access to items that are buried within folders. The alias of the Apple Menu Items folder makes it easier to hone your Apple menu. This Mac is also running MicroSeed's HAM, which turns folders and folder aliases in the Apple menu into hierarchical menus, greatly expanding the Apple menu's usefulness. Also note the Quit command on the menu bar, added by Adam Stein's shareware System 7 Pack. After starting a program, you can return to the Finder and choose Quit to reclaim roughly 300K of memory. You can then use a utility such as QuicKeys to start additional programs.

Instructions for creating aliases using the Finder appear in the Step-by-Step box "Making an Alias." After you've mastered aliases, you may want to experiment with an alias utility. One is an extension called FinderHack, by Donald Brown, the creator of CE Software's QuicKeys. FinderHack adds a menu to the Finder called Futz (I said it was easy, not poetic). Select an icon and choose the FinderHack command called Make Alias in Apple Menu, and FinderHack creates an alias of the icon and puts the alias in the Apple Menu Items folder for you. FinderHack's Make Alias As command gives you a dialog box that lets you name the new alias and specify where you want to store it. FinderHack also provides commands that instantly delete selected icons or move them to the Trash.

STEP-BY-STEP

Making an Alias

The instructions is this box show how to create an alias using the System 7 Finder.



To create an alias:

1. **Select the original file or folder by clicking it once.**
2. **Choose Make Alias from the Finder's File menu.**
   The Finder creates the alias. The alias's icon appears adjacent to the original and has the word *alias* tacked onto its name; you can rename the alias if you like.
3. **Drag the alias to its final destination.**
   You may want to keep it on the desktop, or maybe in the Apple Menu Items folder.

An alias by another name

If you'd like the Finder to append something other than *alias* to an alias name, use Adam Stein's shareware utility, Adam Stein's System 7 Pack, which can perform several other useful System 7 modifications.

Another handy alias maker is AliasThis!, by Bruce Oberg and Gordon Sheridan. Drag an item to the AliasThis! icon, and AliasThis! creates an alias of that item in the Apple menu. Better still is Lawrence Harris's shareware Alias Director, which even lets you create aliases that don't have icons — a nice way to avoid clutter if you like to keep aliases on the desktop.

Styling and trashing aliases

To show that an item is an alias, the Finder puts its name in *italics*. Bill Monk's Alias Stylist utility lets you specify a different type style for alias names.

One problem with aliases is that they remain on your hard disk even if you delete the items you aliased. To fix that, try Maurice Volaski's free TrashAlias, a control panel that automatically deletes an alias when you delete the item it points to. Cliff McCollum's shareware AliasZoo utility helps you keep track of aliases and can also delete orphaned ones.

The Quick Tips box "Alias Ideas" describes some ways to use aliases.

QUICK TIPS

Alias Ideas

There are almost as many ways to use aliases as there are ways to use the Mac. Here's a collection of ideas to get you started.

Put items in your Apple menu

Don't move an original program, document, or folder to the Apple Menu Items folder. Create an alias of it, and put the alias in the Apple Menu Items folder. Remember you can rename the alias if you like.

By the way, if you use aliases in your Startup Items folder, you should know that they will open after any "real" programs located in the Startup Items folder.

Access a frequently used folder

Perhaps you always use a certain folder that you keep buried within other folders. For fast access to that folder, make an alias of it and move the alias to your desktop. You can then open or modify the contents of the folder by opening its alias — not by opening folder after folder to get to the one you want. You can even copy items to the folder by dragging them to its alias.

Access a file server volume

An alias provides an easy way to mount an AppleShare file server volume or a disk or folder made available through System 7's file-sharing features. (See Chapter 33 for an introduction to AppleShare and file servers; System 7's file-sharing features are discussed in the section "File Sharing 101" in this chapter.)

First, mount the volume as you normally would, and then select it and choose Make Alias. Rename or move the alias as desired. Thereafter, to connect to the server, simply open its alias, and you'll receive the standard AppleShare log-on dialog box. (You won't even see the log-on dialog box if you access the server as a guest when making the alias.) You can even use this technique to copy a file to a server volume that you haven't yet mounted: Just drag the file to the alias icon and respond to the log-on dialog box as necessary. The Finder connects to the server and then copies the file.

Access your hard disk from any Mac on your network

First, use the Finder's Sharing command to make your hard disk available. Next, make an alias of your hard disk, and then copy that alias to a floppy disk. To connect to your hard disk from a different Mac in your network, simply insert the floppy disk and double-click the alias.

Access an extension or a control panel from somewhere else

Normally, system extensions reside in the Extensions folder, which is in the System Folder. If you want to access an extension from the Control Panels window, make an alias of the extension and move the alias to the Control Panels folder (also within the System Folder). Similarly, if you want to access a certain Control Panel directly from the Apple menu, make an alias of it and move the alias to the Apple Menu Items folder.

Start programs and open documents

If you make an alias of a program, you can start the program and open a document by dragging the document icon to the alias icon. When you do, you'll see the alias icon become highlighted — just as a folder or disk icon is highlighted when you copy an item to it. Release the mouse button, and the Mac starts the program and opens the document. If the application icon doesn't highlight when you drag the document icon to it, the application may not be able to open that type of document. See Chapter 28 for more details on drag-launching and on data exchange in general.

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Quickly access all the programs on your hard disk

First, use the Finder's Find command to search for all applications at once. (See the section "Fast Finding.") After the Mac has found and selected all the applications, choose Make Alias. The Mac makes an alias of every application it finds. You can then move those aliases into a single folder to have quick access to every program on your hard disk.

Automate access to archived files

Many people use file compression utilities such as StuffIt to compress and archive older files that they copy to floppy disks and then delete from their hard disks to free up space. If you're in this group, you can use aliases to easily locate your archives — no more rooting through floppies trying to locate the disk that contains a certain archive.

First, make your archive file as you normally would and then copy it to a floppy disk. Next, make an alias of the archive on the floppy and then copy the alias from the floppy to your hard disk — perhaps to a folder called Archive Aliases. Finally, delete the archive from your hard disk. When you need to access the archive, just double-click on its alias. The Mac will ask you to insert the appropriate floppy.

Fast Finding

It's a good idea to organize documents and programs within folders. But as your filing system gets complex — with folders within folders within folders — locating and opening a particular file can become cumbersome.

If you know part of a file or folder name, you can use System 7's Find command to open the item with a few keystrokes — no matter how many folders it's buried in. Choose Find from the Finder's File menu (or type ⌘-F) and then type part of the item's name and press Return. When the Finder locates the icon, it displays and selects it. Press ⌘-O to open it.

Finding more choices

The Find dialog box contains a button called More Choices. When you click More Choices, the Find dialog box is replaced by a larger dialog box containing pop-up menus that enable you to search using a variety of different criteria (see Figure 23-6 "Detailed Searching"). To specify that the Finder locate and select all the items that meet the criteria, click the All at Once check box. When this option is unchecked, the Finder stops each time it locates and selects an item.

The Find dialog box's expanded searching options enable you to perform some surprisingly powerful tasks. (Table 23-1 describes each search option and its criteria.) Want to create an alias for every program on your hard disk? First, create a new folder named *Programs* and move it to the desktop. Choose Find, click More Choices and then set up the pop-up menus to read *kind contains application.* (Choose Kind from the leftmost pop-up menu, Contains from the middle one, and Application from the rightmost pop-up menu.) Next, check the All at Once button and then click Find.

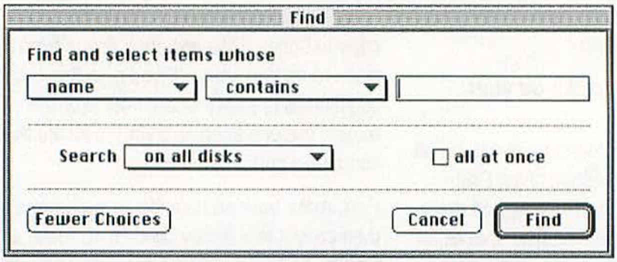

Figure 23-6: Detailed Searching When you click More Choices in the Finder's Find dialog box, a new dialog box appears whose pop-up menus give you more ways to search. Clicking the All at Once button tells the Finder to find and select all the files rather than stopping after the first one it finds.

Table 23-1
Find Options

When Searching By...	*Your Options Are...*	*and You Specify...*
Name	contains, starts with, ends with, is, is not, doesn't contain	part or all of the item's name
Size	is less than, is greater than	a size value (in K)
Kind	contains, doesn't contain	alias, application, document, folder, or stationery
Label	is, is not	a label name or None
Date Created	is, is before, is after, is not	the current date or use arrows to change to the desired date
Date Modified	is, is before, is after, is not	the current date or use arrows to change to the desired date
Version	is, is before, is after, is not	a version number
Comments	contain, do not contain	some text that appears in the Get Info comment
Lock	is	locked or unlocked

The Finder locates and selects every application program on your hard disk (except those located on the desktop). Choose Make Alias from the File menu, and the Finder creates aliases and selects *them.* Drag one of the aliases to the Programs folder you created; the other aliases are still selected, so they'll tag along. Now you can use the Programs folder as the gateway to any program on your hard disk.

Using Find to do a quick backup

Here's how to use the Find command to perform a quick backup of all the files that you changed on a given day. Click the Find dialog box's More Choices button and then configure the pop-up menus to read *date modified is* followed by the current date. Check the All At Once box and click Find. After the Finder has located and selected all the modified files, drag one of them to the icon of a backup disk (the others will follow, because they're still selected). Of course, you'll need sufficient free space on the backup disk to hold all the files.

Start Up with These

System 7's System Folder contains a folder called Startup Items. Toss an icon in this folder, and the Mac opens it automatically the next time you start up — very handy if you always use a particular program. (To keep your file system orderly, don't toss an actual application icon into the folder — use an alias of the icon instead.)

You can use the Startup Items folder to automatically open documents, too. In fact, you can use it to open anything that you can double-click — including sounds. Toss a sound into the Startup Items folder, and you'll hear a silicon serenade each time you start up.

If there's a sound in your System file you'd like to use, here's how to copy it to the Startup Items folder: Open the System Folder, and then double-click the System file to open it. Locate the sound, and then press Option while dragging the icon to the Startup Items folder. This puts a copy of the sound in the folder instead of moving the original. (This Option-drag technique for copying an item instead of moving it works throughout System 7.)

Speak Up with These

If your Mac supports Apple's PlainTalk voice-recognition technology, you can have fast access to frequently used files by placing them (or their aliases) in the Speakable Items folder, within the Apple Menu Items folder. After doing so, you can open the item by saying "open" followed by the item's name. See Chapter 34 for more details about PlainTalk voice recognition.

Finder 7 Shortcuts

With System 7, it's easier than ever to move around on the desktop. The following list describes Finder 7's capabilities and how to access them quickly:

To Accomplish This...	*Do This...*
Eject a disk and remove its icon from the desktop	Drag the icon to the Trash or select the disk and choose Put Away (⌘-Y).
Select an icon from the keyboard	Type the first few characters of the icon's name.
Bypass the warning dialog box that appears when you choose Empty Trash	Press Option when choosing Empty Trash.
Hide the current application when switching to another application	Press Option while choosing the program you want from the Application menu.
Rename an icon	Select it, press Return, and then start typing.
Quickly determine whether a file is locked or unlocked	Select the file and press Return. If no border appears around the name, the file is locked.
Clean up everything	Choose Select All and then press Option and choose Clean Up All.
Clean up selected items only	Press Shift and choose Clean Up Selection.
Organize icons by name	Choose By Name from the View menu; then choose By Icon or By Small Icon. Next, press Option and choose Clean Up by Name.
Close all disk/folder windows	Press Option while clicking a close box or choosing Close.
Copy a file from one folder to another instead of moving it	Press Option while dragging the file to the destination folder.
Copy an item to the desktop instead of moving it	Press Option and drag the item to the desktop.
Open an item and close its window	Press Option and double-click the item.
Open the folder or disk window that holds the current directory window	Press ⌘ while clicking on the window's title, and then choose the folder or disk name you want.
Abort a program that seems to have crashed	Press ⌘-Option-Esc and click Force Quit.
Open a document with a program that may not have created the document	Drag the document's icon to the program's icon or alias.
Skip installing all system extensions during one startup	Hold down Shift during startup.
Select the item nearest the upper-right corner of the desktop	Press ⌘-Shift-up arrow.
Zoom a directory window to fill the screen	Press Option while clicking the window's zoom box.

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Selecting Icons from the Keyboard

To Select...	*Do This...*
The icon to the left or right of the currently selected icon	Press the left-arrow or right-arrow (icon views only) key
The icon above or below the currently selected icon	Press the up-arrow or down-arrow key
The next icon alphabetically	Press Tab
The previous icon alphabetically	Press Shift-Tab

Keyboard Shortcuts for Outline Views

To Do This...	*Press...*
Expand the selected folder's outline	⌘-right arrow
Collapse the selected folder's outline	⌘-left arrow
Expand the entire outline of a selected folder	⌘-Option-right arrow
Collapse the entire outline of the selected folder	⌘-Option-left arrow

File Sharing 101

Many Macs are islands, but at least as many are used in places where there are other Macs — offices, classrooms, and user group meetings. If yours is in the latter category, you'll love System 7's built-in file-sharing features. On the simplest level, System 7 file sharing lets you exchange files between Macs without having to use floppy disks: Connect a cable, click a few times, and one Mac's hard drive icon appears on the other Mac's desktop. You can then shuttle files and folders between the Macs using standard click-and-drag techniques.

First steps

Say you want to set up a simple file-sharing scheme to exchange files between a PowerBook and a desktop Mac (or any two Mac models). To connect the computers, use a pair of Farallon PhoneNet StarConnectors, which are often discounted to under $20 each. With the cable connected, open the PowerBook's Sharing Setup control panel. Type a name in the Owner Name and Macintosh Name boxes; then in the Sharing area, click Start. When the control panel tells you file sharing is on, close the control panel. (If you don't see the Sharing Setup control panel, use the System 7 Installer disk to install file sharing software.)

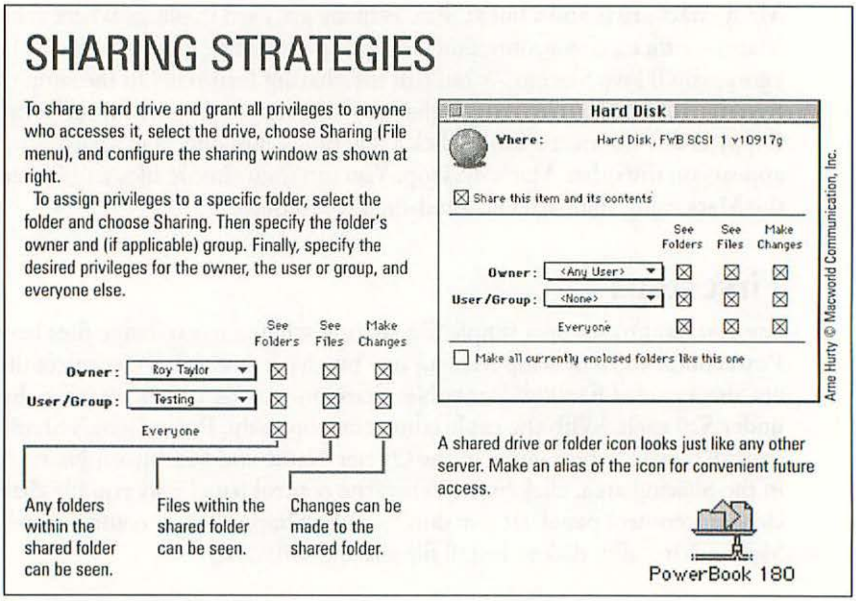
Next, select the PowerBook's hard disk icon (if you just want to share a single folder on the hard disk, select the folder's icon instead) and choose Sharing from the Finder's File menu. In the Sharing window, check the box labeled "Share this item and its contents". Below that item, choose <Any User> from the Owner pop-up menu (see Figure 23-7 "Sharing Strategies"). Close the window, clicking Save when asked to save changes. You've just set up the Mac as a file server.

Now go to the other Mac and open its Chooser desk accessory. Click the AppleShare icon, and the PowerBook name you specified a moment ago appears in the right side of the Chooser. Double-click that name, and a dialog box appears. Click Guest and press Return. In the next dialog box, select the hard drive name and press Return again. In a moment, an icon for the PowerBook's hard drive appears on the desktop. You can now copy files back and forth between the two Macs.

(Keep in mind most PowerBooks also offer the SCSI disk mode, which enables you to connect the PowerBook to a desktop Mac and access the PowerBook's hard drive. If you have to transfer a lot of data, you might prefer the faster SCSI disk mode over System 7 file sharing.)

File sharing tips

The sharing scheme I just outlined pairs up well with the Find command's daily backup trick I described earlier. After the two Macs are connected, you can use the Find command to locate the day's files for copying.



SHARING STRATEGIES

To share a hard drive and grant all privileges to anyone who accesses it, select the drive, choose Sharing (File menu), and configure the sharing window as shown at right.

To assign privileges to a specific folder, select the folder and choose Sharing. Then specify the folder's owner and (if applicable) group. Finally, specify the desired privileges for the owner, the user or group, and everyone else.

		See Folders	See Files	Make Changes
Owner:	Roy Taylor	☒	☒	☒
User/Group:	Testing	☒	☒	☒
	Everyone	☒	☒	☒

Any folders within the shared folder can be seen.

Files within the shared folder can be seen.

Changes can be made to the shared folder.

Hard Disk

Where: Hard Disk, FWB SCSI 1 v10917g

☒ Share this item and its contents

		See Folders	See Files	Make Changes
Owner:	<Any User>	☒	☒	☒
User/Group:	<None>	☒	☒	☒
	Everyone	☒	☒	☒

☐ Make all currently enclosed folders like this one

A shared drive or folder icon looks just like any other server. Make an alias of the icon for convenient future access.

Arne Hurty © Macworld Communication, Inc.

Figure 23-7: Sharing Strategies

To avoid having to thread your way through the Chooser the next time you want to access the PowerBook's hard drive, make an alias of the hard drive icon while you're connected to it. You can automatically connect to the PowerBook by double-clicking the alias. Or, stash the alias in the Apple Menu Items folder to access it from that menu.

When you're done with the shared hard drive, drag its icon to the Trash. Then return to the PowerBook and turn file sharing off. You'll save memory and the Mac runs a bit faster if you turn off file sharing when you aren't using it.

For convenience's sake, I've deliberately avoided discussing the security features in System 7 file sharing. When it's just you, a couple of Macs, and some files to be moved, passwords get in the way. When you're part of a larger network, though, you'll probably want to set up *access privileges* — settings for who can see and modify shared files and folders.

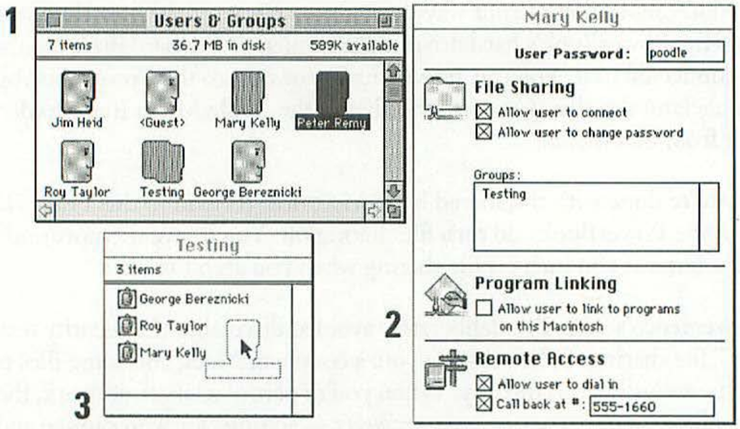
Access has its privileges

You can use System 7's access privilege settings to lock some people out of certain folders. First, use the Users & Groups control panel to specify a list of *registered users* — people who are allowed access to shared items. You may also want to assemble registered users into *groups* — collections of users who work on related projects or in the same department. After creating users and groups, you can control access privileges for a given folder by selecting the folder and choosing the Sharing command (see Figure 23-8 "Users & Groups" and refer to Figure 23-7 "Sharing Strategies").

In the previous steps, you set up a *peer-to-peer* file-server system. The opposite of peer-to-peer networking is a *dedicated* file server — a Mac and hard disk, running a program such as Apple's AppleShare, that provide centralized storage for a group of Macs. A central file server costs more to set up — the AppleShare software itself retails for over $1,000 — but provides better security and is easier to back up, because shared files are in one place instead of scattered across a network. If you do outgrow peer-to-peer file sharing, you can upgrade to AppleShare and retain your user and group settings. For more details on AppleShare, see Chapter 33.

Expanding System 7

Since releasing System 7, Apple has released some optional extensions that enhance System 7's capabilities. The PC Exchange extension lets you work with DOS PC disks as if they were Mac disks — great for offices that use Macs and PCs.



7 items 36.7 MB in disk 589K available

Jim Heid <Guest> Mary Kelly Peter Remy

Roy Taylor Testing George Bereznicki

Mary Kelly

User Password: poodle

File Sharing

☒ Allow user to connect

☒ Allow user to change password

Groups: Testing

Program Linking

☐ Allow user to link to programs on this Macintosh

Remote Access

☒ Allow user to dial in

☒ Call back at #: 555-1660

Testing

3 items

George Bereznicki

Roy Taylor

Mary Kelly

Figure 23-8: Users & Groups With the Users & Groups control panel, you can create a list of people who can access your folders and disks (1). After opening the control panel, choose New User from the File menu, then rename the new user icon. Double-click a user's icon to change settings (2). The Remote Access options appear only if you've installed Apple's AppleTalk Remote Access software, which lets you connect to another Mac via a phone modem to exchange files and print documents. You can also assemble users into groups — you might group together the members of a department or the staff for a particular project. To create a group, choose New Group from the File menu. Rename the group icon, then drag user icons to the group icon (3). Peter Remy is being added to the Testing group.

At Ease provides a simpler way to start programs and protect your hard disk from modification. It's designed for families who have kids that would just love to get in there and rearrange their folks' files. Another At Ease benefit: When you use it instead of the Finder, you have about 200K more memory for programs. It's a good way to shoehorn more into a RAM-cramped Mac.

But few things get a System 7 guru's blood flowing faster than the notion of *scripting* — creating your own short programs that automate repetitive tasks such as backing up and then deleting older files (see Chapter 25). In the depths of System 7 is a software mechanism called Apple events, which gives programs the ability to send commands and data to each other. System 7's publish-and-subscribe features (described in Chapter 28) rely on Apple events to beam data between programs without you having to use the Clipboard.

Other System 7 enhancements from Apple include QuickTime (discussed in Chapter 21) and the PlainTalk text-to-speech software (covered in Chapter 34). System 7's modular design enables Apple to enhance its capabilities while giving us the option of choosing only those enhancements that are relevant to our needs. If you're into dynamic data, scripting, and speech, you can drop the appropriate

QUICK TIPS

Understanding Enablers

Before System 7.1 came along, Apple often released a new system version along with each new Mac model. This scheme was necessary in order to support the new model's features, but it created headaches as people wondered whether or not to upgrade to the new version or which version was the best for their machines.

Beginning with System 7.1, Apple devised a different scheme for supporting new models: *system enablers.* Like an extension, a system enabler loads during memory at start-up time and provides the software that System 7.1 needs to work on a given Mac. This mechanism eliminates the need for Apple to release a machine-specific system software update each time a new Mac model comes out.

The base version of System 7.1 has built-in support for all Mac models that shipped before the release of System 7.1, from the Macintosh Plus through the Macintosh Quadra 950 and PowerBook 145. Macs shipped after System 7.1's release include system enablers specific for that model or family of models. System Enablers are stored in the top level of the System Folder (not in the Extensions folder). They load before any extensions or control panels.

A full set of system enablers is not included in Apple's System 7 Upgrade Kit. This can mean trouble if you're on the road and you need to reinstall the system software on a PowerBook that requires a system enabler. If you can't find a dealer who has or will let you copy the enabler you need, you may want to carry along a backup set of the System 7.1 disks that came with your computer. Or just carry one floppy containing the enabler your PowerBook needs.

extensions in your System Folder and be on your way. (You may have to take a quick detour for a memory upgrade.) If your needs are simpler, you can do without these extensions and simply use System 7 for its built-in capabilities — such as its ability to run numerous programs at once. On the other hand, if you always use QuickTime or AppleScript, you may want to use System 7 Pro, which includes these and other advanced features.

Understanding System 7 Multitasking

Future computer historians will note the late 1980s as the period when *multitasking* began to make its way from mainframes and minicomputers to microcomputers like the Mac. Multitasking — a computer's ability to run numerous programs simultaneously — has been around on big computers for years, but early personal computers lacked the processing speed and the memory capacity needed to load and switch between numerous programs.

Apple took its first steps toward multitasking in 1987 when it released MultiFinder, which provided the most important features of a multitasking operating system — the ability to run several programs at once and to print documents and perform other time-consuming jobs while you continue to work. MultiFinder didn't change much from its initial release to the version that runs under System 6.x.

The next major step was the development of System 7. System 7 adds enhancements that many people expect of a powerful multitasking operating system, including features that enable programs to communicate with each other to exchange data and commands. As proof of Apple's commitment to Mac multitasking, System 7 doesn't give you the option of running under the "single Finder." In System 7, MultiFinder is always active; indeed, MultiFinder and the Finder are one and the same.

Even with System 7, the Mac's system software doesn't yet have all the capabilities of full-fledged multitasking. But it doesn't have all its compatibility and performance headaches, either. In this section, I examine some of the technicalities behind the Mac's ability to run several programs at once. I also present some memory-conservation tips that will help you squeeze more out of — and into — your Mac's memory.

Multitasking basics

Even before MultiFinder and System 7, the Mac provided a scaled-down form of multitasking — desk accessories, those small programs you can summon from the Apple menu. But the Mac's system software places a limit on how large a desk accessory can be, and while some skilled programmers have managed to cram a lot into some desk accessories, no desk accessory can match the capabilities of a stand-alone program. Desk accessories are just that — accessories, complements to a full-scale application.

System 7 lets you have more than one program on the screen simultaneously and switch between them with a mouse click. When you start an application on a Mac running System 7, the Finder doesn't disappear as it does without MultiFinder. Instead, it remains in memory and is visible behind the application's window. If you want to switch back to the Finder — perhaps to start another program or organize some disk files — you need not quit the program you're running. Instead, simply click anywhere within the Finder's desktop or choose Finder from the Application menu. After you return to the Finder, you can start another program. You can continue this process until you run out of memory — which may happen sooner than you expect.

Under the hood

In the computer world, the process of putting one application on hold and activating a different one is called *context switching*. It's important to understand that context switching isn't multitasking. Programs that are put on hold don't perform any work; they simply hang around on the sidelines, waiting to be called back into action.

System 7's multitasking features surface when you use programs designed for them. When a program is written to recognize and use System 7's multitasking capabilities, it can work *in the background* — that is, when it isn't the active application. A communications program can transfer a file over the phone lines while you type away in a word processor. A database manager can sort a database. A spreadsheet program can crunch through a complex calculation. And almost any program can print, thanks to PrintMonitor, a background printing program included with the Mac (see the Background box "Background on Printing").

BACKGROUNDER

Background on Printing

Printing to a laser or ink jet printer is like standing in line to buy vodka in Russia: The result is great, but you hate the wait. The PrintMonitor application that accompanies System 7 and System 6 MultiFinder lets the Mac print in the background to a PostScript printer and to most Apple printers. PrintMonitor won't make your pages appear more quickly: Indeed, they'll probably take longer, because PrintMonitor must share processor time with other applications. But PrintMonitor, like any *spooler* (computerese for software that handles background printing), lets you resume work sooner by intercepting data en route to the printer, saving it on disk, and then returning control of the Mac to you while it talks to the printer in the background.

Merriam-Webster hasn't recognized it, but *spool* has joined *radar* and *scuba* in that elite group of acronyms that have lowered their case and evolved into words. The acronym was born when pioneering computer scientists realized that the time they saved by spooling was lost by saying "simultaneous peripheral operations on line" — the catchy phrase that SPOOL once represented.

To activate background printing, use the Chooser desk accessory to select the LaserWriter or other printer driver, and then select the Background Printing On button. Subsequently, when you issue a Print command, the Mac creates a *spool file* containing the document's contents. System 7 constantly scans for the creation of a spool file. When it detects one, it starts PrintMonitor, which sends the spool file's contents to the printer in the background. As you'll see in Chapter 32, PrintMonitor's window lists the documents waiting to be printed and lets you postpone printing, schedule printing for a specific time, and rearrange the order of the waiting documents.

For details on third-party spooler utilities that provide more features than PrintMonitor, see Chapter 25.

Any program that performs time-consuming tasks that don't require your attention is a candidate for background operation. You aren't likely to see support for background operation in highly interactive applications such as painting programs. The only time-consuming, hands-off task such programs perform is printing, and PrintMonitor takes care of that.

What multitasking is and isn't

How can the Mac run foreground and background programs simultaneously? It can't. The Mac's system software is a master of deception: It switches its attention from one program to another so quickly that all the programs *appear* to be running at once.

To understand how multitasking operating systems create this illusion, it's important to step back and look at how computers run programs. Nearly all computers, from Macs to mainframes, execute one instruction at a time, in sequence. The exceptions are today's ultra-powerful supercomputers, which use a new computing technique called *parallel processing*, wherein multiple processors execute instructions simultaneously.

In a multitasking operating system, each program you run is called a *task*, or a *process*. When a multitasking operating system is running several programs, the computer is still executing one instruction at a time, in sequence. However, the operating system switches its attention from one program to the next, executing a certain number of one program's instructions before putting that program on hold and turning to the next one (see Figure 23-9 "Multitasking on the Line"). This *task switching* occurs so quickly that all the programs appear to run simultaneously.

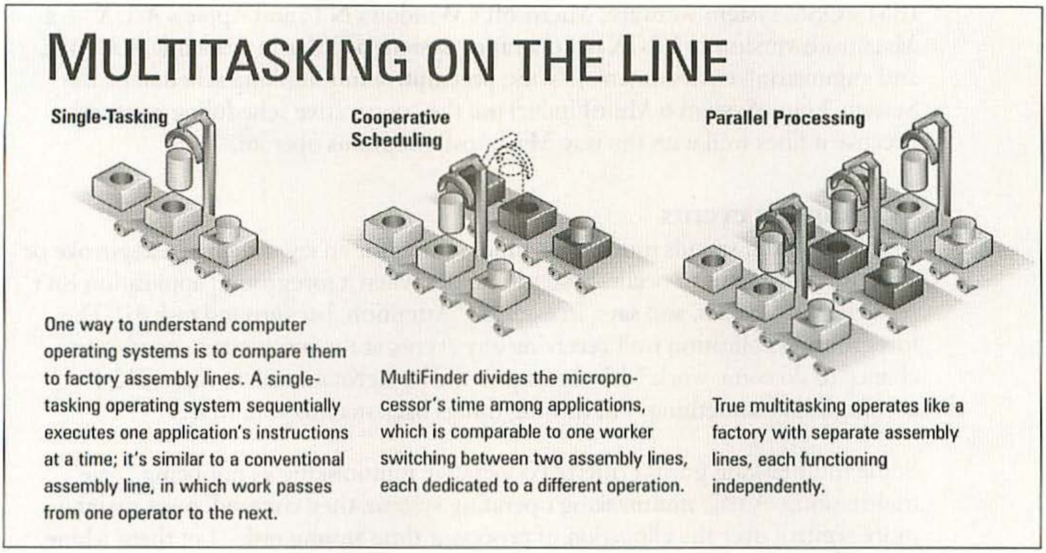
Time to run

You don't have to understand how the Mac divides its time between programs in order to use it, but a bit of background can help you appreciate the complex juggling that goes on inside a multitasking operating system.

The portion of an operating system responsible for dividing the computer's resources among tasks is called a *task scheduler*. Two basic approaches to scheduling tasks exist — *preemptive* scheduling and *cooperative*, also called *non-preemptive*, scheduling.

Preemptive versus cooperative

With preemptive scheduling, the task scheduler is tied to the internal "heartbeat" that all microcomputers use to govern their operation. The task scheduler prioritizes each task, giving each task control of the computer's resources for a specific



One way to understand computer operating systems is to compare them to factory assembly lines. A single-tasking operating system sequentially executes one application's instructions at a time; it's similar to a conventional assembly line, in which work passes from one operator to the next.

MultiFinder divides the microprocessor's time among applications, which is comparable to one worker switching between two assembly lines, each dedicated to a different operation.

True multitasking operates like a factory with separate assembly lines, each functioning independently.

Figure 23-9: Multitasking on the Line

number of heartbeats. When they've elapsed, the computer's operating system puts the current application on hold, turning its attention to the next one.

With cooperative scheduling, the task scheduler plays a more passive role in allocating processor time. The responsibility for dividing the processor's time is shared among all the applications that are running. An application must be "well behaved" — it must return control of the processor to the operating system at frequent intervals so that other applications get their turn to run. If one program hogs too much of the processor's time, others slow to a crawl. Worse, if a program crashes, the whole system is likely to crash, because the haywire application may never return control to the operating system. An operating system that uses cooperative multitasking is a chain that's only as strong as its weakest link.

Traffic lights versus yield signs

The differences between preemptive and cooperative multitasking are like the differences between traffic lights and yield signs. Traffic lights govern the flow of cars in a rigid way: Traffic from each side of the street gets a chance to flow only as long as the traffic lights allow it. (Assuming some yo-yo doesn't run a red light.) Yield signs, however, turn driving into a cooperative effort. Traffic flows smoothly only when all the drivers cooperate and take turns using the intersection.

IBM's OS/2 system software, Microsoft's Windows NT, and Apple's A/UX — a Macintosh version of UNIX (an operating system popular in academic, scientific, and engineering environments) — use preemptive multitasking schedulers. But System 7 (and System 6 MultiFinder) use the cooperative scheduling approach because it jibes well with the way Macintosh programs operate.

Waiting for events

A Mac program spends much of its time waiting for an *event* such as a keystroke or a mouse movement to occur. System 7 senses when a foreground application isn't receiving any events, and says, in essence: "Attention, background task #1! The foreground application isn't receiving any events at the moment, so now's your chance to do some work." It's then up to the background task to say: "OK, I accomplished something. I'm turning things back over to you, Mac."

Some multitasking gurus criticize cooperative multitasking as not being "true" multitasking. A true multitasking operating system, they contend, must maintain more control over the allocation of processor time among tasks. Let them whine. The bottom line is that the Mac's cooperative multitasker yields excellent results as long as program developers follow Apple's programming guidelines, which stipulate how applications that perform background tasks should operate.

The price of multitasking

As my publisher will be happy to tell you, the more projects you take on, the more time you need to finish each one. The same applies to the Mac, whose performance slows when applications run in the background. An application usually runs slower in the background than in the foreground, and a foreground application runs somewhat slower than it would if no background application were running. I say *usually* and *somewhat* because the specific performance penalties depend on what the background and foreground applications are doing. As a general rule, the Mac's overall performance slows with each background task you add.

An example: If you're running PageMaker and also printing a document in the background using PrintMonitor, PageMaker will feel less responsive: You may notice a slight delay between the time you press a key and when its character appears, or the mouse pointer's movement may seem sluggish and erratic. You'll also wait longer to see your hard copy, because PrintMonitor slows down each time the Mac returns its attention to PageMaker in order to respond to those keyboard and mouse events. Of course, on faster Macs, the slowdown will be less noticeable. A fast Mac is better at multitasking than a Plus, Classic, or SE.

Copying Files in the Background

System 7's Finder 7 can copy files in the background while you work in other programs that are already running — great if you're copying a large number of files to a backup disk.

To indicate that you can switch to another program while something takes place in the background, System 7 introduced a new type of dialog box — the *movable modal* dialog box. As the first part of its name suggests, a movable modal dialog box can be moved around on the screen. *Modal* refers to the fact that you can't click outside of the dialog box. In the past, virtually all Mac dialog boxes were modal: You couldn't do anything until you confirmed or canceled the dialog box. A movable modal dialog box works a bit differently: It won't let you do anything else in the current program, but you can switch to a different program and continue working. The Find command also uses movable modal dialog boxes, as do a few other Finder operations. You can recognize a movable modal dialog box by the stripes that appear in its title bar.

On the other hand, when an inactive application isn't performing a background task, it doesn't impose a performance penalty on the currently active application. For example, if Microsoft Word and PageMaker are both running, neither imposes a direct performance penalty on the other, because neither is written to perform work in the background.

Other than affecting your stopwatch, another drawback to multitasking is how it hits your bank account. Keeping multiple programs close at hand requires a hard disk, and keeping them in memory at the same time requires lots of memory. With multitasking and memory, the phrase "the more, the merrier" applies in spades. (See Figure 23-10 "Applications on the Menu" and the Quick Tips box "Multitasking Survival Tips.")

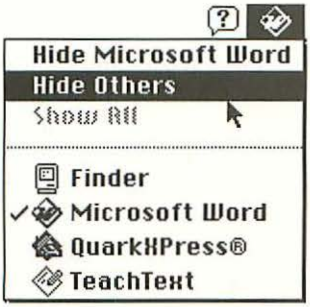


Figure 23-10: Applications on the Menu System 7's Application menu (located at the right edge of the menu bar) lets you quickly switch between programs and avoid screen clutter by hiding windows of applications you aren't using.

QUICK TIPS

Multitasking Survival Tips

Here are some tips to help you get more out of the Mac's multitasking features.

Save when switching

These days, all major Mac programs are written to coexist with System 7 and other programs. Nonetheless, it's always a good idea to use the active application's Save command before switching back to the Finder or to another open application. If switching programs causes a system crash, at least your latest work will be saved. For that matter, saving often is a good idea regardless of what you're doing.

Master System 7 navigation

System 7 makes it easy to create a messy electronic desktop; when several programs are open, switching to a specific window can be difficult. Under System 7, the icon at the right end of the menu bar is actually a menu — the *Application menu.* You can use it to switch between open applications and better still, to hide the windows of other applications and the Finder. Hiding other windows is a good way to avoid screen clutter (refer to Figure 23-10 "Applications on the Menu"). Alas, it requires a bit more memory, because the Mac must save the state of each program's windows before hiding them.

Understanding the Mac's Memory

If you've been seeing "not enough memory" error messages lately — or if you've just bought a memory upgrade and you'd like to put that extra space to work — read on. Few of the Mac's components offer more opportunities for fine-tuning than memory. When you understand how the Mac uses memory, you can make a variety of adjustments to improve overall performance, increase the number of programs you can run simultaneously, or speed up a particular program. And none of these adjustments requires you to open the Mac. You can fine-tune your memory from the comfort of your mouse.

Memory basics

Before looking at memory maximizing specifics, I'll step back and show you the big picture to make sure we're looking at the same scene, because many Macintosh newcomers confuse the Mac's RAM with its hard disk storage, probably because both are described using the same units of measurement: the kilobyte (K), or 1024 bytes; and the megabyte (MB), or one million bytes (technically, 1,048,576 bytes).

RAM is temporary storage space formed by a collection of chips soldered onto the Mac's circuit board or installed in small, plug-in boards. When the Mac is turned off (whether by you or by a power failure), the contents of RAM disappear faster than punch on New Year's Eve. Most Macs come with between 4MB and 8MB of RAM, which you can expand — more about that later.

A hard disk, by contrast, provides permanent storage (or at least it's designed to; drives can fail, making a regular back-up routine essential — see Chapter 27). Most Macs include hard drives that store 80MB or 230MB; much higher capacities are available.

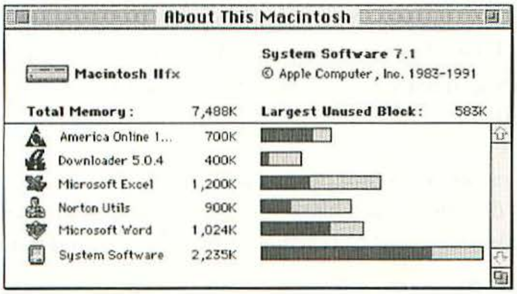
You must remember this

In the Mac, as in other computers, RAM plays a few roles. RAM holds a large portion of the Mac's fundamental system software (called System 7, although many people are still using the older, less capable System 6). When the Mac starts up and displays its "Welcome to Macintosh" message, it loads this RAM-based system software from the hard disk.

During startup, the Mac also loads system extensions, enhancements to the system software. You can tell when a Mac is loading system extensions — their icons appear along the bottom of the screen.

The final step in the start-up process involves loading the Finder, the program that gives you the desktop and Trash icons. The Finder itself uses roughly 500K of RAM — almost four times the total amount of RAM built into the original Macintosh.

The point is that some of the Mac's RAM is filled right off the bat. You can find out how much RAM your system software and extensions use by choosing the About This Macintosh command from the Finder's Apple menu. A window appears describing how your Mac's RAM is being used (see Figure 23-11 "Window into Memory"). This window can be a memory maximizer's best friend.



Macintosh IIfx

System Software 7.1
© Apple Computer, Inc. 1983-1991

Total Memory: 7,488K
Largest Unused Block: 583K

America Online 1...	700K
Downloader 5.0.4	400K
Microsoft Excel	1,200K
Norton Utils	900K
Microsoft Word	1,024K
System Software	2,235K

Figure 23-11: Window into Memory
The About This Macintosh window displays a bar graph for the system software as well as each open application. Each bar shows how much memory is allocated to that program; the dark-shaded portion of each bar shows how much of that RAM the program is actually using.

Making room for programs

When you start an application program such as Microsoft Word or ClarisWorks, the Mac sets aside some RAM for the program and then copies the program from the hard drive into that memory. Actually, with most programs, only part of the program is copied into RAM — the part that implements the program's most heavily used features. When you choose a particular command for the first time since starting the program, you may notice a short delay as the Mac retrieves the required software routines from the hard disk. (If your hard disk has an activity light on its front panel, it blinks.) When this happens, the Mac is loading one of the program's *code segments* from disk.

Most large programs are divided into numerous code segments. The Mac can load a given segment into memory when it's needed, and it can purge segments from memory to free up space. This scheme enables developers to create programs with smaller minimum memory requirements. On the down side, frequently accessing the hard disk slows performance, especially on a slower Mac such as a Classic. Later, I'll show how to minimize segment loading.

How programs store documents

Part of the memory a program receives is reserved for the documents you have open as you work. Some programs store an open document entirely in RAM; common examples include integrated packages such as ClarisWorks and Microsoft Works and drawing programs such as Adobe Illustrator, Aldus FreeHand, and Claris' MacDraw series. With these programs, the maximum size of a document is limited by the amount of its program's free RAM. An example: When you start Microsoft Works 3.0, the Mac gives Works 1536K of RAM. Of that amount, about half is taken up by Works' program code; roughly 750K remains free for the documents you'll work with.

Other programs don't store an open document entirely in RAM, but instead swap portions of the document to and from the hard disk, keeping in RAM only the portion you're working with at the moment. Most stand-alone word processors — Microsoft Word, WordPerfect, WordStar's WriteNow, Claris' MacWrite Pro — work this way, as do Aldus PageMaker and QuarkXPress and most database managers, including FileMaker Pro. This approach lets you create much larger documents, but moving around within a document can take longer (it's that relatively slow hard disk again).

Whether a program stashes open documents entirely in RAM or swaps them between RAM and the hard disk may seem like a trivial technical point, but it has important ramifications you may need to consider when fine-tuning your short-term memory.

Memory Maximizing Techniques

You can make four basic memory-related adjustments. Notice that each has a potential drawback: Weighing each technique's pros and cons is an important part of memory maximizing.

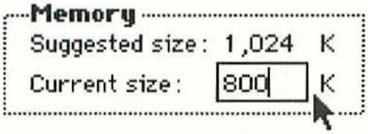
Get Info and memory

If you want to run two programs at the same time but you're a little lean on RAM, you can reduce each program's memory requirements to shoehorn both into memory. Each program is likely to run slower, because the Mac will have to load and discard segments more frequently. And integrated packages and drawing programs will be limited to smaller documents. Conversely, if you want a given program to run faster or you want to create larger documents with an integrated package or drawing program, you can increase its memory allocation. When a program has more RAM to work in, it won't have to go out to the hard disk to load code segments as frequently. But less free RAM will be available for other programs. For advice on allocating memory to some popular programs, see Figure 23-12 "Allocating Memory" and the Background box "RAM Strategies."

The disk cache

The *disk cache* — accessed through the Memory control panel — is an area of system software RAM that holds information recently read from the hard disk. If this information is needed again, the Mac retrieves it from the cache instead of from the hard disk. A larger disk cache can improve performance if you frequently switch between two programs or perform repetitive tasks. If you work sporadically — if you're never sure which program, command, or document you may use next — a large disk cache is less likely to boost performance. A large disk cache also leaves less free RAM for running programs.

Experiment with various cache sizes (restart the Mac after each adjustment to make your change take effect). If performance doesn't improve, reset the cache to its original size — or even consider reducing its size to free up RAM for other uses.



Memory

Suggested size: 1,024 K

Current size: 800 K

Figure 23-12: Allocating Memory Using the Get Info window, you can adjust a program's current memory size value. If the current memory size is greater than the suggested size, you can safely reduce the current size to match the suggested size. If both memory size values are identical, you can try reducing the current size value, but the program may not run reliably.

BACKGROUNDER

RAM Strategies

To change an application program's memory allocation, select its icon and choose Get Info from the Finder's File menu. Type the desired memory allocation in the Current Size text box (refer to Figure 23-12 "Allocating Memory"). You can also use AppSizer, a shareware control panel from Peirce Software, to change memory sizes on the fly — that is, at the moment you start a program. This can be handy if you frequently alternate between various memory-allocation settings depending on the project at hand. AppSizer also lets you temporarily change the memory allocation of a program located on a CD-ROM drive — a feat beyond the Get Info command.

How much of a change should you make? Here are some guidelines for several popular programs.

- *Microsoft Word* Word's present memory allocation is 2048K (2MB), but the program can run in as little as 512K. (If you specify 512K, the Finder asks if you're sure you want to set the memory size to less than the suggested minimum. Click OK.) Performance will be sluggish and the grammar checker and other plug-in modules may not work. If you're creating a stripped-down version of Word, remove unessential plug-in modules and file converters from the Word Commands folder (located within the Word folder). Word 5.1 offers a minimal installation option.

  As for increasing Word's memory allocation, you may want to boost it beyond 2048K if you compile large indexes or tables of contents, search-and-replace with long documents, or import large scanned images. Increasing or decreasing Word's memory allocation does not affect maximum document length, although you may not be able to search-and-replace or compile indexes with long documents.

- *ClarisWorks and Microsoft Works* These integrated packages store open documents entirely in RAM, so their memory allocation directly affects the size and quantity of the documents you can create. ClarisWorks normally receives 900K, but can run in 768K. Microsoft Works normally receives 1536K, but can accept 675K. (Note that you may not be able to open a large document that you created before reducing the program's memory size. If this happens, restore the memory allocation to its larger size, open the document, and divide it into a number of smaller ones.) Both programs benefit from a larger RAM allocation by enabling you to create larger documents or open more documents simultaneously.

- *Aldus PageMaker and QuarkXPress* PageMaker 4.2 requires at least 1500K; QuarkXPress 3.1 requires at least 1700K. Reducing either program's memory allocation slows performance and can compromise reliability; also, you may not be able to use some Aldus Additions or Quark XTensions (both add features to their respective programs). You can free up some RAM by removing any import/export filters you don't use. Boosting either program's allocation improves performance by reducing segment loading. Both programs provide a greeking option that displays text as gray lines; use this feature to speed up overall scrolling and page display (see Chapter 10).

- *Claris MacDraw Pro* This drawing program normally receives 3000K. If you have a compact monochrome Mac such as a Classic, you can run the program in as little as 1000K. For creating color documents, however, you'll want to give the program at least 2000K — more if you have a large-screen monitor. See the MacDraw Pro manual for more memory tips.

- *Adobe Type Manager* If you use this popular extension, you can improve the text-display speed of all your programs by opening the ATM control panel and increasing the size of the font cache.

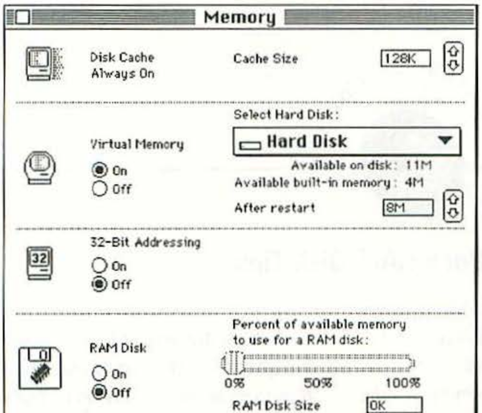
Virtual memory

Virtual memory — accessed through the Memory control panel — blurs the lines between hard disk and RAM storage by tricking the Mac into thinking that part of the hard disk is actually RAM (see Figure 23-13 "Virtually Memory"). This lets you run more programs than would otherwise fit into RAM, but switching between programs takes longer than if you had the equivalent amount of real RAM. (Virtual memory doesn't work on the Mac Classic, SE, Plus, LC, or PowerBook 100. To use virtual memory on the original Mac II, you need a Motorola 68851 PMMU chip.)

In theory, you can also use virtual memory to run a program that's too large to fit into RAM. For example, if you want to run a program that requires 4MB of free RAM on a Mac that has only 3MB free, you can use virtual memory to make up the 1MB difference. In practice, however, this usually delivers painfully slow performance. You should have enough real RAM to run the largest program in your software library.

Using a RAM disk

Like virtual memory, a *RAM disk* is a software sleight-of-hand. But instead of treating part of the hard disk as RAM, a RAM disk sets aside some memory to act like a disk. Because RAM is faster than a hard disk, anything stored on a RAM disk opens at top speed. Most new Macs let you create a RAM disk using the Memory control panel. If your Memory control panel doesn't contain a RAM disk option, use a utility program to create a RAM disk. My favorite is AppDisk, a $15 shareware program by Mark Adams, available through on-line services and user groups.



Disk Cache
Always On
Cache Size 128K

Virtual Memory
● On
○ Off
Select Hard Disk: Hard Disk
Available on disk: 11M
Available built-in memory: 4M
After restart 8M

32-Bit Addressing
○ On
● Off

RAM Disk
○ On
● Off
Percent of available memory to use for a RAM disk: 0% 50% 100%
RAM Disk Size 0K

Figure 23-13: Virtually Memory On most Mac models, the Memory control panel lets you set aside some hard disk space as an extension of RAM. Here, the 4MB of RAM in a PowerBook 170 is being supplemented with virtual memory to create the equivalent of an 8MB machine. The controls at the bottom of the window let you create a RAM disk; if your Mac's Memory control panel doesn't have a RAM Disk section, you'll need to use a utility such as AppDisk to create a RAM disk.

One drawback to a RAM disk is that the RAM it uses isn't available for running programs. Another drawback is that a RAM disk's contents vanish when the power goes. You need to restore the contents of a RAM disk each time you start up your Mac (this doesn't apply to the PowerBook 100, 160, 180, 180c, or Duo models). Connectix Corporation's Maxima and Apple's own PowerBook File Assistant utilities have features that let you save the contents of a RAM disk on PowerBooks other than the 100.

What should you stash in a RAM disk? Ideally, the System Folder as well as the application programs you want to run at top speed. Unfortunately, you'll need a few megabytes of RAM disk space just to hold System 7's bloated System Folder. (You may pare down the RAM disk's System Folder by removing printer drivers such as the LaserWriter and ImageWriter files, as well the Scrapbook file, file-sharing extensions, and anything else you can live without. You can always restart from your hard drive's System Folder when you need the extra capabilities.)

Extensions, control panels, and memory

I mentioned earlier that system extensions — those programs that load during startup, displaying icons along the bottom of the screen — nibble away at your free RAM. Keep this in mind next time you're tempted to add an extension that promises to boost your productivity or make you chuckle. Flashy extensions or control panels such as After Dark or Bruce Tomlin's SoundMaster (which plays sounds when you insert and eject disks, throw away files, and perform other activities) are particularly RAM hungry, as are electronic mail extensions such as CE Software's QuickMail and Microsoft Mail. If you use QuickTime-supporting programs, be sure to use QuickTime version 1.6 or later — 1.5 and earlier versions tend to hog RAM even when you aren't running QuickTime-savvy programs.

POWERBOOK ANGLE

PowerBook RAM Disk Tips

If you're using a PowerBook and you have a RAM disk large enough to accommodate a System Folder and an application program, use the Startup Disk control panel to specify that your Mac start up from the RAM disk. Then restart. When the desktop reappears, use the PowerBook control panel to put the hard disk to sleep. You can now run from the RAM disk, and greatly extend the time between battery charges. You will need to wake up the hard disk in order to save documents on it. You can save documents on a RAM disk, but if a system crash corrupts the RAM disk, you'll lose your work.

When you're running on empty

When you're running low on free RAM, disable any extensions you can do without (extensions you *can't* do without may include ones required by a piece of hardware such as a cartridge drive, scanner, or video card). You can disable extensions or control panels by manually dragging them out of the Extensions or Control Panels folders, both located in the System Folder. An easier way is to use Ricardo Batista's Extension Manager, a free control panel that lets you activate and deactivate extensions and control panels. Several commercial extension managers are also available.

After you disable some extensions or control panels (whether manually or with an extension manager), choose Restart from the Finder's Special menu. You can also temporarily disable all extensions by restarting and holding down the Shift key until you see the "Welcome to Macintosh" message with the text *Extensions off* below it.

System software and memory

System 7's file-sharing features (discussed earlier in this chapter) require nearly 300K of RAM. If you aren't using file sharing, turn it off with the Sharing Setup control panel. The Mac will run slightly faster, too.

If you're using one of the original versions of System 7 — version 7.0 or 7.0.1 — you may want to get a copy of Apple's System 7 Tune-Up extension, which modifies the system software to use memory a bit more efficiently and to handle low-memory situations better. If there isn't enough memory available to start a program, for example, the Finder will ask if you want to quit a different program in order to make room.

QUICK TIPS

Using a Less-Memorable PlainTalk Voice

If you use PlainTalk's text-to-speech features, you can use memory more efficiently by choosing voices judiciously. The high-quality male voice uses the most memory — 2.6MB. The compressed female voice, by comparison, uses only 700K. She sounds a bit hoarse, though — you may not want to listen to her all day.

You can hear examples of both compressed and uncompressed male and female voices by playing the PlainTalk demonstrations on the *Macworld Complete Mac CD* included with this book. A QuickTime-based demonstration is in the Handbook Movies folder; a SoundEdit Pro version of the same demonstration is in the Digitized Sounds folder.

Similarly, if there isn't enough memory to print a document in the background (that is, while you continue to work), the Mac will ask if you want to print it immediately or wait until later. Use the About This Macintosh command to find out which system version you're using. If a bullet character (•) appears after the version number, the tune-up is already installed. If you have System 7.1, you don't need the tune-up — Apple rolled its features into System 7.1.

More RAM for your Mac

Of course, the best way to avoid running out of memory is to buy more of it — RAM prices have never been better. If you have a Classic, Plus, or SE, upgrade to 4MB. If you have a PowerBook other than the 100, upgrade to at least 6MB (preferably 8MB) to take advantage of a RAM disk. If you have a color Mac, an SE/30, or a Classic II or Performa 200, consider upgrading to 8MB — or beyond, especially if you work with color scanned images, digital sound, or QuickTime movies. (If you add more than 8MB to a Mac II, IIx, or IIcx, use the MODE32 system extension to access all the RAM. It's available free through user groups, Apple dealers, or on-line services.) For details on adding memory, see Chapter 31.

But even a hefty RAM upgrade will probably only keep the low-memory messages at bay for a while. They'll return as you acquire increasingly complex programs and become accustomed to running more of them at once. When that day arrives, remember the techniques I've described here — they can help you cram more into your RAM.

QUICK TIPS

Saving RAM on the IIci and IIsi

If you use the built-in video port on a Mac IIci or IIsi, you can also free up some memory by using the Monitors control panel to switch to the black-and-white (monochrome) display mode. The IIci and IIsi use part of their main RAM to store the bits that represent the screen image. With a standard 14-inch monitor in the 256-color display mode, up to 320K is required for this area of memory, called the *screen buffer*. In monochrome mode, only 38K is required. This tip doesn't apply to other color Macs: They provide separate video memory, called *VRAM*. (See Chapter 31 for more details on video and VRAM.)

CHAPTER 23 CONCEPTS AND TERMS

- The System 7 Finder makes it easy to find and select files (even from the keyboard), to view the contents of disks and folders, and to customize the Mac's operation to suit your tastes and work habits.
- To add fonts to System 7, you drag them to the System Folder — the Finder stashes them in the appropriate place (in the System file for System 7.0 and in the Fonts folder in System 7.1).
- An alias is a small file that points to a document, an application, a disk, or a folder. When you open an alias, the Mac opens whatever the alias points to. Creating aliases is a great way to have fast access to the items you use most.
- System 7 allows for peer-to-peer file sharing: You can make your disks and folders available to other computers on your network, and theirs can be made available to you.
- Although the Mac's basic operating style is unchanged in System 7, there are several changes you'll need to adjust to if you've used earlier versions.
- Multitasking refers to a computer's ability to run multiple programs at once. With preemptive multitasking, the computer gives each task control of the computer's resources for a specific amount of time. With cooperative multitasking — the kind System 7 provides — the responsibility for dividing the processor's time is shared among all the tasks that are running.
- A Mac's performance slows when programs are running in the background.
- Two ways to get the most from your Mac's memory include choosing software that uses memory sparingly and adjusting a program's memory requirements using the Finder's Get Info window.

access privileges
Settings for who can see and modify shared files and folders. Privileges are specified for users — people who are allowed access to shared items. You may also assemble *users* into *groups* — collections of users who work on related projects or in the same department.

alias
A small (about 1K) file that acts as a remote control for another item, usually another file or a folder. When you double-click an alias, the Mac opens the item that the alias points to.

background task
An operation, such as printing, that occurs while you work in a different program.

context switching
The process of putting one application program on hold and activating a different one.

disk cache
An area of system software RAM that holds information recently read from the hard disk. If this information is needed again, the Mac retrieves it from the cache instead of from the hard disk. A larger disk cache can improve performance if you frequently switch between two programs or perform repetitive tasks.

multitasking
A computer's ability to run numerous programs simultaneously.

RAM disk
A software sleight-of-hand that sets aside some memory to act like a disk. Because RAM is faster than a hard disk, anything stored on a RAM disk opens at top speed.

scripting
Creating your own short programs that automate repetitive tasks such as backing up and then deleting older files.

stationery pad
A master for a frequently created document such as a business letter, fax cover sheet, or newsletter. By creating a document and then turning it into a stationery pad (using the Get Info window), you can reuse its contents without worrying about accidentally saving over them.

virtual memory
A System 7 feature that blurs the lines between hard disk and RAM storage by tricking the Mac into thinking that part of the hard disk is actually RAM. This lets you run more programs than would otherwise fit into RAM, but switching between programs takes longer than if you had the equivalent amount of real RAM.

CHAPTER TWENTY-FOUR

Maintenance Tips and Techniques

IN THIS CHAPTER

- Keeping your Mac, keyboard, and mouse in top shape
- Cleaning floppy drives — or not?
- Washing the screen without damaging it
- Setting up your system for comfort, health, and efficiency
- Extending PowerBook battery life

In computing's primeval period (30 years ago), computers used vacuum tubes — those glowing glass bulbs. One IBM SAGE computer, several dozen of which formed the backbone of the United States' air defense system from 1958 to 1983, used 25,000 tubes. Maintenance was hellish. A staff of technicians worked full-time keeping the four-story behemoth running, and even with a battery of built-in diagnostics, finding a faulty tube often meant turning the room lights off and looking for its weakened glow.

Today you can service a computer with the lights on. But despite the reliability of solid-state electronics, computers like the Mac still have some mechanical parts that require routine attention. Still, you'd be surprised at how many people ignore the basics of setup and maintenance vital for a healthy Mac. Or maybe you wouldn't. If you're part of the group that believes preventative maintenance should be prevented, this chapter is for you.

You'll be glad to know that keeping your Mac and its peripherals in tune doesn't require any fancy equipment or technical background. There isn't a single acronym in this chapter. In fact, Mac maintenance can be summarized in one phrase — keep it clean and cool.

Cleaning Up Your Mac

Although a layer of dust can do damage by acting as a blanket that keeps heat in, electronic chips don't have to sparkle to work. The only items on a Mac that need regular cleaning are the screen and the mechanical parts — the keyboard, mouse, and possibly, the floppy disk drives.

ON THE CD

- The Dvorak keyboard layout (in The Best of BMUG collection)

Keeping the keyboard clean involves keeping it free of dust and liquids. Each key is a switch with two contacts that close; the key generates a signal when you press it. Dust or spilled maple syrup will either prevent that signal from being generated, or will cause a kind of keyboard stuttering: You'll press *c* and get six of them as the contacts intermittently make and break their connection through the grime.

To dust a keyboard, first turn off the Mac, and then unplug the keyboard. Take the keyboard into a different room (one without computers), turn it upside down, and blow into the keys with short, powerful breaths. Keep those breaths dry by swallowing a couple of times beforehand, and don't think about Grandma's cookies as you work. Better still, rest your lungs and buy a can of compressed air such as Falcon's Dust-Off at a camera store. Read the directions on the can first: With some products, holding the can upside-down or at other odd angles causes icy wet liquid to escape. Don't substitute a bicycle pump, air compressor, or other unfiltered air source. It can make matters worse by blowing dust into the keyboard.

Don't spill the Jolt cola

Compared to liquids, though, dust is a minor enemy to keyboards. Crying over spilt milk may serve no purpose, but orange juice or soda spattered on a keyboard is definitely worth a tear or two. When a sugary liquid dries, it leaves behind a sticky residue that can seal or even corrode the key's contacts. If you commit this cardinal sin, take your keyboard to a dealer for a complete cleaning.

If you're in the middle of a big project and can't do without the keyboard, however, there is one small hope. It's a desperate measure that won't replace professional service, but it may get you through a crunch. Buy a bottle of spray contact cleaner (not tuner cleaner) at an electronics store. Unplug the keyboard (with the Mac's power off), hold it over a sink, and spray a generous amount of cleaner into the keyboard while repeatedly pressing its keys. Quickly turn the keyboard upside-down to let it drain. Wait half an hour or so, and then reconnect the keyboard and try typing.

If the keyboard works, say a prayer of thanks and vow to take it in for service as soon as possible. If it doesn't, or if one or two keys still act up, try again. If you can't locate contact cleaner, try a bottle of tape-recorder head cleaner. But remember that this technique is a last-ditch effort. If you can live without your keyboard for a while, having it properly cleaned is the best solution.

Keeping the rodent dry

The mouse is another spill-prone component. Liquid spilled on it will seep in around the button and gum up its switch. Again, professional cleaning is the best remedy, but you can probably make do by disassembling the mouse and spraying contact cleaner into its switch.

A mouse can also take in liquid from the bottom. If you roll it through a puddle, its rubber ball will pick up liquid and transfer it to the contact points, causing sluggish pointer movement or none at all. If that happens, turn the mouse upside-down, remove the retaining plate that surrounds the ball, then invert the mouse and catch the ball as it falls out. Clean the ball with a lint-free cloth and clean the rollers inside the mouse with a cotton swab moistened with tape head cleaner or alcohol. In any case, cleaning the mouse regularly is a good habit to get into, because the mouse picks up dust and lint as it's used.

Dusty Drives and the Screen

The debate over whether or not to clean floppy disk drives frequently has been known to spark brawls at user-group meetings. Some say regular cleaning helps prevent disk errors by removing dust and particles that occasionally flake off a disk's surface. Clean-drive advocates swear by disk drive cleaning kits, which contain a disk-like item that houses a circular pad of fiber-based cleaning material. You moisten the pad with cleaning fluid, insert it in the holder, and put the holder in the drive, where it spins like a disk and cleans the heads.

Others say leave the drives alone unless they're acting up. They claim that cleaning can do more harm than good because of too much or too little fluid, or because dirt and grime in the cleaning pad can act like sand paper on the drives' heads. I'm from that school. Some of my Macs are approaching their tenth birthdays, and their drives have never been cleaned and have never misbehaved — after near-constant use in houses plagued with woodstove dust in the winter and pollen in the summer. I'm not saying that cleaning is bad for drives, mind you: I'm just presenting both sides of the story. I believe cleaning is unnecessary if you use high-quality disks and prevent an accumulation of dust in your work area.

The screen is another area where improper cleaning can do damage. Most screens have a nonglare coating that common glass cleaners will promptly dissolve, turning the screen's finish from matte to glossy. You can keep the screen clean with lint-free tissues (such as Kimwipes) or photographic lens-cleaning tissue.

If you must use a liquid to remove sticky fingerprints, use a cleaning fluid made for computer screens. It won't harm the finish, and some of those products repel dust — at least according to the companies that sell them. Although you can use window cleaner to clean the Mac's case, be sure to spray it on a cloth (not a linty paper towel) rather than directly on the case.

Beating the Heat

Cleaning is important for the Mac's mechanical parts; cooling is vital for its electronic ones. Electronic components have self-destructive lifestyles. Heat is their worst enemy, yet they generate heat as they work. To keep its parts cool, a computer's case must be ventilated so that cool air can replace hot. The designers of the first Macs (ones preceding the SE and II) placed cooling vents at strategic locations in the machine's case to provide convection cooling: The heat created inside the machine rises and exits through the vents in the top of the case, drawing in cooler air through the vents at the bottom. Modern Macs use a similar ventilation technique, but supplement it with fans.

You can easily thwart a Mac's ventilation process by blocking a set of vents. If you cram a Mac between books or magazines (or use it on a bearskin rug), you'll block the lower vents, preventing the intake of cool air. If you put an old Mac such as a Plus under a shelf or set books or papers on top of it, you'll block the top vents, trapping the hot air inside. Either way, the result is the same: You'll choke off the flow of air, allowing heat to build to potentially damaging levels. And damaging doesn't have to mean chip meltdown. Even if it doesn't damage the hardware, too high a temperature can cause a system crash.

To beat the heat, give any Mac — but especially the fanless Mac Plus — room to breathe — an inch or two on the sides and several more on the top. Keep it away from a radiator or other heat source. Also, keep it out of sunlight. Direct sunlight will bake a Mac and cause screen glare to boot. If you have a Plus or earlier model, be especially careful to keep the left side of the machine cool — that's the side where the heat-generating power supply lives.

The Complete Mac Wardrobe

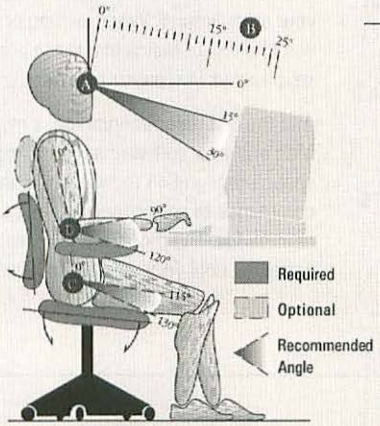
Cleaning and cooling keeps your Mac healthy, but what about you? Your equipment should be set up to allow you to use it without having to hire a live-in ophthalmologist and chiropractor. Fortunately, several companies have come to the rescue with gadgets and gizmos that all the well-dressed Macs are wearing. Figure 24-1 "A Workstation that Works" illustrates ergonomic issues. The Quick Tips box "Tips for Healthy Computing" describes a few exercises that can help.

Apple's wrist-friendly keyboard

If you suffer from wrist pain caused by typing, you may want to consider the Apple Adjustable Keyboard, which sports a "split keyboard" design that supposedly keeps your wrists in a healthier position. You can angle the left- and right-hand sections of the keyboard to up to 30 degrees to find the typing position that feels best. The

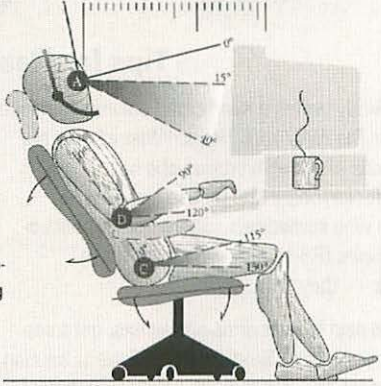
A WORKSTATION THAT WORKS

Today's ergonomists recognize that there is no perfect position that workers can maintain all day. For most people, a comfortable workstation is one that can accommodate two or more positions, enabling you to adjust your chair, monitor, and keyboard to fit your current task or inclination. Most people find the upright and slightly reclined positions portrayed here best for computer use. If you do a fair amount of traditional desk work, you'll probably want a chair that supports a forward-leaning position as well.



Screen Posture always follows the eyes; screens placed too low or angled improperly are a major source of slouching **(A)**. The distance from the screen to your eyes should be only slightly greater than the distance you normally maintain between reading material and your eyes **(B)**. (Bifocal wearers may require a steeper screen angle than the ones portrayed.)

Chair Seat contours should follow the contours of your back. Adjust chair height so that you don't feel pressure on your tailbone (seat too low) or lower thighs (seat too high). Ergonomists used to recommend 90 degrees as a good angle between thighs and spine, but recent research shows that more people favor a more open posture **(C)**.



Keyboard Your arms should be relaxed at your side, with elbows a few inches from your body **(D)**. Position your chair and keyboard to minimize reaches. When you change position, from upright to reclined for example, be sure to reposition your keyboard (and screen). An adjustable keyboard stand, which enables you to use the mouse without a stretch, is useful for this purpose, but you can also place the keyboard in your lap.

Desk A comfortable desk height is particularly important if you keep the keyboard on your desk. If you don't have a keyboard stand and you work at a nonadjustable surface that's too high, try raising your chair and putting a platform or box beneath your feet. If your desk is too low, try fastening blocks to the ends of the legs.

Copy Stand If you often look at paper documents when you work, use a copy stand, mounted so that it puts your work in the same plane and at the same height as the screen. If you look at the hard copy more than the screen, orient your chair or screen such that the copy stand, rather than the Macintosh, is directly in front of you.

You Keep moving—motion makes the blood flow. And remember to take a break from computer work every hour.

Prepared with the assistance of Eileen Vollowitz, PT, of Back Designs, in Oakland, California. —Joe Matazzoni

Figure 24-1: A Workstation that Works

Tips for Healthy Computing

Jane E. Brody writes a syndicated column on health issues for *The New York Times*. What follows are descriptions of some exercises she has recommended for keyboard and mouse jockeys. As someone who sometimes suffers from *repetitive-stress injuries* (RSIs), I can vouch for these exercises — they help.

If you feel pain in your arms and wrists, get treatment early. As Jane Brody writes: "Experts caution against trying to work through pain, since that will only make the injury worse and could result in irreversible damage to the nerve that passes through the wrist into the hand."

Limbering-up exercises

1. Clench your fist tightly, and then release, fanning out your fingers. Repeat five times.
2. Grasp the fingers of one hand and gently bend back the wrist. Hold this position for five seconds, and then repeat for the other hand.
3. Grasp the thumb of one hand and gently pull down until you feel the stretch. Hold for five seconds, and then repeat for the other hand.
4. Massage the inside and outside of each hand with the thumb and fingers of the other hand.

Take breaks — and consider talking

In addition to performing these exercises, stand up and take a break every hour or so. Stretch. Move your arms around. When writing or taking notes, don't hold your hands in a tense position over the keyboard as you pause to collect your thoughts.

And the last recommendation is my own: If your Mac and your software support Apple's PlainTalk speech-recognition technology, consider using voice commands to select tools, open icons, and choose commands. The more rest your hands get, the better — until your voice gets hoarse.

Apple Adjustable Keyboard also includes detachable palm rests to provide a flat surface to rest your hands when you're not typing; volume control, mute, and record keys (handy — no pun intended — for multimedia work); a separate extended keypad that includes function keys, a numeric keypad, and cursor-control keys; and adjustable feet that let you change the slope of both the main keyboard and the extended keypad.

I commend Apple for going to great lengths to design and build a new and different keyboard, but is the Apple Adjustable Keyboard the answer to repetitive-stress injuries? I'm not sure. For one thing, when you use the keyboard in a split position, you tend to hunch your shoulders forward — a posture that's bad for your back and neck. For another, the separate keypad's keys are tiny, and if you use it extensively, you'll probably compromise good posture by stretching over to it.

The Dvorak alternative — and I don't mean John

If you think your fingers are doing too much walking over the keyboard, a better course of action may be to switch your keyboard layout to the Dvorak layout. This layout was designed by a Navy researcher named August Dvorak in the thirties, and puts the most frequently used characters in more accessible positions. (Believe it or not, the conventional typewriter layout was created around the turn of the century in an effort to slow down typists who were causing early typewriter mechanisms to jam.)

The CD-ROM included with this book contains a Dvorak keyboard layout you can use with System 7. Simply drag the layout file to your System Folder icon and click OK when the Finder asks if it should install the layout in the System file. Next, use the Keyboard control panel to activate the new layout. (For faster access to the layout, use Apple's ResEdit utility to activate System 7's keyboard menu — see the next chapter for details.)

Tilt and swivel stands

For me and many others, a computer monitor is too low to look at for hours on end without developing a pain in the neck. Swivel stands made by firms such as Curtis Manufacturing and Kensington raise the monitor and let you tilt it to a more comfortable viewing angle. You can also try propping up the front of the screen by placing something under it, such as the lid of a disk box or two 1½-inch-high plastic furniture leg-tips (my personal choice).

Tilt-and-swivel stands are also available for compact Macs such as the Classic, SE, and Plus. And you'll be glad to know that tilting a Mac does not affect the operation of computer pinball or billiard games.

Mac II stands

The original Mac II, the IIx, and the IIfx are big Macs that take up a lot of desk space. You can set up these Macs on their sides alongside your desk by using metal stands such as Kensington's Macintosh II Stand, which is also available with extension cables for the keyboard and monitor. Set up the Mac so that the power light is closest to the floor. This puts the floppy drive and programmer's switch within reach. (It also gets the floppy drive away from the dusty floor.) Don't set a big Mac on its side without a stand; you'll block the cooling vents. This doesn't apply to the Mac IIcx, IIci, or Quadra 700 by the way. They're designed to work in either vertical or horizontal orientations.

Mouse pads

These are squares of rubber that protect furniture when using a mouse, and according to their proponents, smooth mouse movement. They're just the thing if you're forced to set up shop on an antique desk. You can also make a mouse pad yourself from wet-suit neoprene or even a piece of clean cardboard, such as the backing on a pad of paper.

Anti-glare screens

If you work near a bright window or under a bank of fluorescent lights, screen glare may take its toll on your eyes. Several firms make filters that attach to a monitor's screen. Some filters distort or blur the screen image, however, so be sure to evaluate several before buying one. It may be smarter to rearrange your work area or change its lighting to eliminate the glare. As you shop for screen filters, you'll encounter some that are advertised as reducing the low-frequency radiation that video tubes give off. There's little evidence that screen filters are effective at blocking monitor radiation.

A safer practice is to be sure you sit at arms' length from the front of the Mac's screen, and at least four feet away from the sides or back of any other monitor. Keep that latter recommendation in mind if you work in an office: Partitions and even walls won't stop low-frequency monitor radiation.

POWERBOOK ANGLE

Taking Care of the Screen

If you're running a PowerBook using the AC adapter, avoid leaving the computer on for more than 24 hours at a time. Doing so can cause temporary problems with the screen, such as shadows appearing when you move windows. You can fix the problem by putting the computer to sleep for at least several hours.

Clean a PowerBook's screen using soft, lint-free paper or cloth moistened with some mild glass cleaner. Don't spray the glass cleaner directly onto the screen.

If you plan to fly with your PowerBook, carry it on with you rather than checking it as baggage. If a PowerBook is shipped in an unpressurized airplane cargo hold, its screen could crack.

Typing desk

Many desks are too high for comfortable typing. To avoid back and neck strain, a typing desk should be roughly 27 inches high. Get a desk intended for typing, and avoid those so-called computer tables with shelves that place the screen at forehead level. To protect your neck and your ego, you should look down slightly on a computer.

Surge suppressor

To guard against lightning bolts and power surges (very brief but potentially very damaging increases in the power company's voltage), you may want to consider a *surge suppressor*. Some surge suppressors also contain power filters, which smooth out the incoming voltage and help remove "noise" that power equipment or nearby thunderstorms can cause.

Some engineers I've talked to say a more common power problem is a *voltage sag*, also called a *brown-out*, which can occur when a power-hungry device like a clothes dryer or air conditioner comes on. Surviving voltage sags requires more complex and more expensive circuitry.

The best power security is a device called an *uninterruptible power supply* or *standby power supply*, which contains batteries that provide a minimum of five minutes of juice after a power failure — not a lot, but enough to save your work and shut down safely. Chapter 35 discusses power problems and power-protection devices in detail.

Batteries and Static

While I'm talking electrons, I have some other electricity-related maintenance tips to pass on. One concerns the battery that goes in the slot above the power switch on pre-SE Macs and that powers the built-in clock and saves your Control Panel settings when the machine is off. It looks like a 1.5-volt AA flashlight battery, but it isn't. It's a 4.5-volt battery, an Eveready 523 or equivalent. If your Mac Plus's clock starts losing track of time, the battery is probably exhausted. You can buy a replacement, which should last about two years, at a camera store. Post-Plus Macs have lithium batteries that last for many years.

Squeezing more juice from your PowerBook

Here are some tips for extending the life of a PowerBook's battery charge.

Turn down backlighting

Backlighting helps make PowerBook screens as legible as they are, but it's also a major drain on battery power. Consider turning backlighting off and working under a bright light or with your back to a window. You'll extend battery life significantly.

An easy way to control backlighting is with the PowerBook Display control panel that debuted with System 7.1 (see Figure 24-2 "Controlling Backlighting"). The PowerBook Display control panel turns off backlighting after a specified period of inactivity.

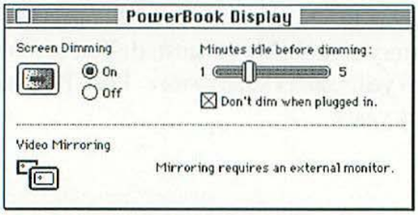
Recharging the batteries

Speaking of battery life, here are the approximate times it takes to recharge a PowerBook's battery:

PowerBook Model	Full Recharge Time (Hours)
100	6 (to 80 percent full in 2)
140, 145, 160, 170, or 180	5 (to 80 percent full in 2 ½)
Duo	1.5

Adjusting processor settings

The PowerBook control panel that accompanies PowerBooks provides several additional power-management features that let you extend battery life. As Figure 24-3 "PowerBook Control" shows, the Battery Conservation slider controls the sleep times for the hard disk and for the PowerBook itself.



Screen Dimming

● On

○ Off

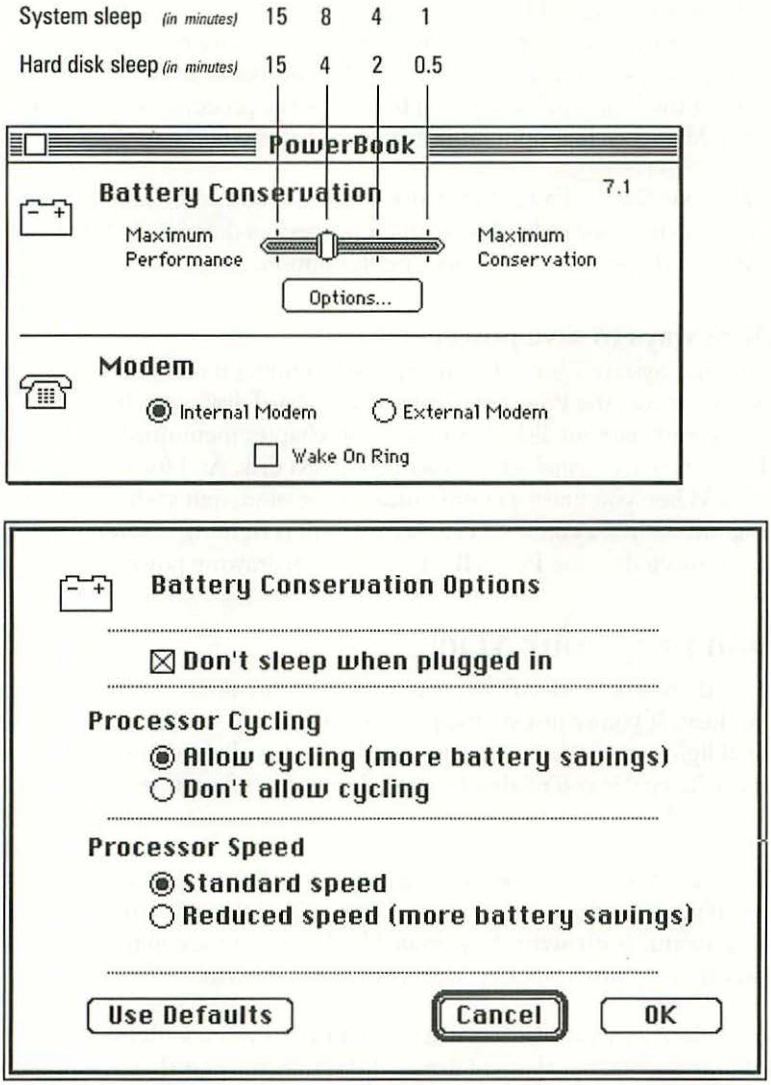
Minutes idle before dimming: 1 – 5

☒ Don't dim when plugged in.

Video Mirroring

Mirroring requires an external monitor.

Figure 24-2: Controlling Backlighting The PowerBook Display control panel turns off backlighting after a specified period of inactivity. PowerBook utility packages such as Connectix PowerBook Utilities provide more sophisticated backlight-control options.



Battery Conservation

Modem

● Internal Modem ○ External Modem

☐ Wake On Ring

Battery Conservation Options

☒ Don't sleep when plugged in

Processor Cycling

● Allow cycling (more battery savings)
○ Don't allow cycling

Processor Speed

● Standard speed
○ Reduced speed (more battery savings)

Figure 24-3: PowerBook Control The PowerBook control panel (top) provides several additional power-management features that let you trade performance for extended battery life — note the Battery Conservation Options dialog box (bottom).

For more control over performance and battery usage, click the PowerBook control panel's Options button to display the Options dialog box. The key parts of the dialog box are the Processor Cycling and Processor Speed areas.

- *Processor Cycling* The PowerBook's processor can turn itself off when you aren't using the computer. The moment you move the trackball or touch a key, the processor turns itself back on. When processor cycling is off — when you select the Don't Allow Cycling button — the processor is on all the time. Select the Allow Cycling option for maximum battery life.

- *Processor Speed* Faster PowerBook models such as the 160, 170, and 180 can save battery power by slowing their processors down to 16MHz. Select the Reduced Speed button to activate this option.

More ways to save power

Don't use System 7 virtual memory when running under battery power. Virtual memory forces the PowerBook to access its hard disk more frequency. Use a RAM disk as your start-up disk. As the previous chapter mentioned, the PowerBook's Memory control panel lets you set up a RAM disk. And for PowerBooks with modems: When you finish a communications session, quit your communications program. When a communications program is running — even if you aren't actually connected — the PowerBook's modem is drawing power.

Don't zap your Mac!

Then there's static electricity, which can be more disastrous to an integrated circuit than heat. If you've just shuffled across a wool carpet on a dry winter day, touch a metal light switch plate, a radiator, or a cat's nose before touching the Mac. That's especially vital if you're about to install or remove a memory upgrade or an expansion board.

The closer you get to integrated circuit chips, the more important it is to be static-free. If you live in a static prone area (one where the humidity is very low), consider using an anti-static wrist strap, available through most computer dealers and mail-order houses, when working with your Mac's innards.

Static electricity can also zap disks, scrambling just enough information to make the disk unreadable. Speaking of floppy disks, they warrant their own special care, which, as Chapter 26 describes, boils down to no heat, no dust, no bending, and no magnetic fields. And if you have an external floppy disk drive, don't set it to the left of a Mac Plus or SE (near its power supply), near a telephone with a mechanical ringer, or underneath a high-intensity desk lamp (the kind with a transformer in its base). These items generate magnetic fields that can cause disk errors.

All in all, Mac maintenance isn't a full-time job. It certainly beats the hoops I had to jump through to keep my first computer, a 1977 Radio Shack Model I, afloat. Its copper connectors corroded faster than an old Chevy in an acid bath, causing frequent system crashes. The solution — a weekly "Pink Pearl treatment," which involved polishing three sets of connectors with a pencil eraser. Happily, the only erasers I see these days are in painting programs.

CHAPTER 24 CONCEPTS AND TERMS

- A Mac's solid-state electronics are durable and reliable, but you can help their health by keeping your machine clean and cool.
- The mechanical components of the keyboard and mouse are especially prone to damage from dust and liquids. Canned air can keep dust out of the keyboard; clean the mouse ball and rollers with a cotton swab moistened with tape head cleaner or alcohol.
- Some people believe regular floppy drive cleaning helps prevent disk errors; others believe you should leave drives alone unless they act up. I'm from the latter camp.
- Improper cleaning of your screen can damage its nonglare coating. Use only lint-free tissues and cleaning fluid made for computer screens.
- If you're prone to wrist pain and other keyboard-related injuries, consider a special keyboard such as Apple's Adjustable Keyboard — if your dealer gives you the option to return the keyboard if you aren't happy with it.
- Tilt-and-swivel stands, mouse pads, wrist rests, anti-glare screens, and computer furniture are among the accessories you can buy to create a comfortable working environment.
- To avoid repetitive-stress injuries, limber up before working by performing a few simple hand exercises. And stand up and stretch regularly.
- To avoid damaging the Mac's circuitry with a static charge, touch a grounded metal object before working inside the Mac, or consider using an anti-static wrist strap.

disk drive cleaning kit
A kit usually consisting of a disk-like item containing a circular pad of fiber-based cleaning material. You moisten the pad with cleaning fluid, insert it in the holder, and put the holder in the drive, where it spins like a disk and cleans the heads.

mouse pad
A square of rubber that protects furniture when using a mouse, and which also supposedly smoothes mouse movement.

processor cycling
A PowerBook feature that enables the PowerBook's processor to turn itself off when you aren't using the computer. The moment you move the trackball or touch a key, the processor turns itself back on.

repetitive-stress injury
A term that covers a wide range of health problems caused by performing the same task over and over again. The most common RSI is carpal-tunnel syndrome, an inflammation of the carpal tendon where it passes through the wrist.

surge suppressor
A device designed to protect the Mac from power surges — very brief but potentially very damaging increases in the power company's voltage.

tilt and swivel stand
An accessory that lets you raise the Mac's monitor and tilt it to a more comfortable viewing angle.

CHAPTER TWENTY-FIVE

Customizing the Mac with Utilities

IN THIS CHAPTER

- Making your computing life easier with utilities
- Putting the Mac on autopilot with macro and scripting utilities
- Using file-compression utilities to shoehorn more files onto a disk
- Learning to use Font/DA Mover and why it's not obsolete
- Extending battery life with PowerBook utilities
- Customizing programs using Apple's ResEdit utility

Utilities are the spice of computing life. I refer not to the local telephone or gas company, but to utility software — programs that make using the Mac easier and more convenient. Utilities form the supporting cast of a computer setup; they work together with the Mac's system software and with your application programs to improve the Mac's performance and enhance its operation.

Want to customize your favorite programs' keyboard shortcuts? Need help managing the files on your hard disk? Longing for a way to resurrect that file you accidentally threw away? Want to customize the colors your Mac displays? Need an easy way to move files between programs or between a Mac and a DOS PC? Want to extend the life of your PowerBook's battery charge?

Utilities can perform these feats and many more. In this chapter, I examine the most popular categories of utility software and spotlight several products from each group. Because there's such an abundance of utilities for the Mac, I don't have room to mention each one; so if I leave out a particular program, don't assume it's under par. Computer dealers, user groups, and mail-order software advertisements are good places to learn about the gamut of utilities available in each class. For a look at some first-rate free and shareware utilities, see the Background box "Utilities for Less."

ON THE CD

- Aladdin Systems' StuffIt Lite and StuffIt Expander
- CE Software's DiskTop and QuicKeys
- Connectix PowerBook Utilities demo
- Norton Utilities and MacTools demos
- Numerous utilities in The Best of BMUG collection

BACKGROUNDER

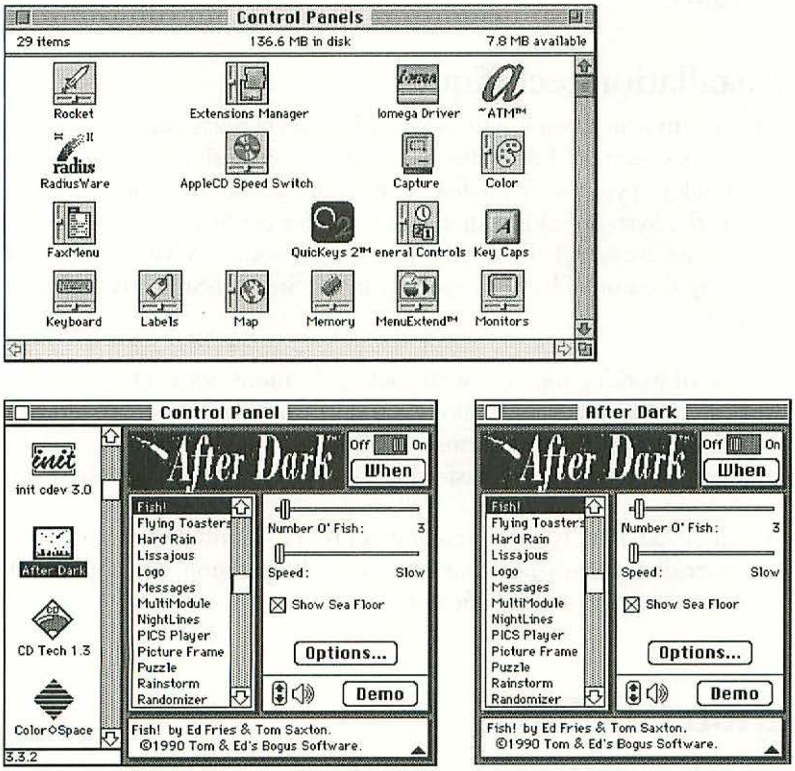
Utilities for Less

Although a large selection of commercial utilities is available, the best place to shop for utilities, extensions, and desk accessories may be a user group or on-line service. While most large software publishers have concentrated on full-blown applications, Mac programming hobbyists and small software firms have churned out more utilities than Dick Clark has TV shows. Here's a small sampling of the most popular free or shareware utilities.

- *Boomerang* by Hiroaki Yamamoto — enhances the Mac's Open and Save dialog boxes with options that let you navigate files and folders quickly. An improved version of Boomerang, SuperBoomerang, is included with Now Software's Now Utilities — along with such goodies as an extension manager, a pop-up menu utility, an Open and Save dialog box enhancer, a menu bar clock, and much more.
- *Compact Pro* by Bill Goodman — a compression utility similar to the StuffIt series.
- *Floppy Fixer* by Frank Beatrous — recovers files from damaged disks.
- *Just Click* by Luis Bardi — lets you switch between programs by clicking on the application menu (as you can with the old System 6 MultiFinder).
- *PwrSwitcher* by David B. Lamkins — lets you switch between programs by pressing the power-on key present on all Apple Desktop Bus keyboards.
- *MaxAppleZoom* by Naoti Horii — enlarges the display area on a 14-inch monitor from the standard 640 by 480 pixels to 704 by 512 pixels.
- *System 7 Pack* by Adam Stein — provides numerous ways to modify the System 7 Finder.
- *DeskPicture* by Clay Maeckel — replaces the desktop pattern with a PICT image.
- *miniWriter* by David Dunham — a simple text editor desk accessory. Another popular DA word processor is the shareware McSink by John Carpenter. Preferred Publisher's Vantage is a commercial version of McSink with more features.
- *SuperClock* by Steve Christensen — adds a digital clock, calendar, and stopwatch to the Mac's menu bar. On PowerBooks, SuperClock also displays a battery gauge that shows how much juice you have left.
- *Switch-A-Roo* by Bill Steinberg — lets you switch between any two video modes (such as color and black and white) without having to use the Monitors control panel. (QuicKeys includes an extension, ScreenEase, that provides the same convenience.)
- *AppDisk* by Mark Adams — lets you create a RAM disk and resize it without having to restart the Mac. For details on AppDisk and RAM disks in general, see Chapter 23.
- *Apollo* by Jeremy Roussak — adds a menu that lets you quickly open often-used applications or documents. Apollo also has teriffic features for changing monitor settings, hiding application windows when you switch programs, and more.
- *ApplWindows* by Hiroaki Yamamoto — modifies the System 7 application menu to not only let you switch programs, but to switch to a specific document window within a given program.
- *Doohickeys* by Jim Luther — a series of small utilities that, among other things, let you eject a cartridge drive without having to shut down System 7 file sharing.

How Utilities Work

Utilities can provide their Mac-enhancing benefits in several ways. Utilities that work together with your application programs may operate as extensions or as desk accessories (sometimes called DAs, these small programs are usually accessed from the Apple menu). Utilities may also take the form of *FKEYs*, those small software routines you run by pressing 1-Shift along with a number key. Or, they may work as Chooser devices, technically known as *RDEVs*, which are accessed using the Mac's Chooser desk accessory. Utilities may also work as *control panels* (cdevs), which show up in the Control Panels folder (see Figure 25-1 "Gaining Control").



Number O' Fish: 3

Speed: Slow

☒ Show Sea Floor

Fish! by Ed Fries & Tom Saxton.
©1990 Tom & Ed's Bogus Software.

Figure 25-1: Gaining Control Some utilities are control panels, also called cdevs. In System 7, control panels live in the Control Panels folder (top), which is located in the System Folder. In System 6.x, control panels line the left edge of the Control Panel desk accessory (bottom left). When you click a cdev's icon, the right side of the Control Panel window changes to reflect the cdev's options. In System 7, control panels appear in their windows (buttom right).

Extensions and DAs

Extensions, also called start-up documents and INITs, reside in your hard disk's System Folder and load into memory when the Mac starts up (see Chapter 23). A desk accessory or extension may also add its own menu to the Mac's menu bar.

Utilities that operate as extensions or desk accessories have one common characteristic: Their benefits can surface in any application, from a word processor to a CAD program. One example of an application-spanning extension is Apple's PC Exchange, which lets SuperDrive-equipped Macs access floppies formatted for DOS PCs. An example from the desk accessory camp is Apple's Note Pad, which lets you store eight pages of text notes. And an example from the FKEY camp is the snapshot FKEY, which creates a file containing the Mac's screen image when you press ⌘-Shift-3.

Installation techniques

The way in which you install these application cohorts depends on the type of utility. As Chapter 23 describes, you install an extension by copying it to the System Folder of your start-up disk. The Finder stashes it in the Extensions folder (inside the System Folder) after asking you for confirmation. In System 6.x, desk accessories are usually installed using Apple's Font/DA Mover utility. (Instructions for using the Font/DA Mover appear in the Step-by-Step box "A Moving Experience.")

Instead of working together with your applications, some utilities perform their work alone. Separate applications you start from the Finder are often self-contained job specialists that perform specific tasks, such as backing up hard disks, resurrecting lost files, or transferring files between Macs and other computers.

A well-stocked utility toolkit combines programs from both camps. You're likely to use extensions to enhance your Mac's overall operation, and applications or desk accessories to perform specific tasks.

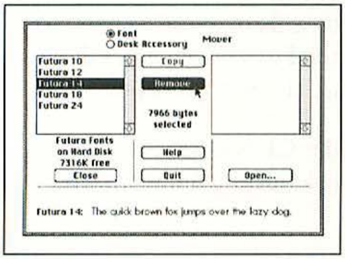
Navigation Copilots

As you become experienced with the Mac, you start wishing for easier ways to control your programs. You may long for more keyboard shortcuts to eliminate reaching for the mouse. Or you may want to automate frequently performed tasks, such as quitting one program, starting another, choosing a command, and then typing some text.

A Moving Experience

Back when fonts and desk accessories were stored in the Mac's System file, Font/DA Mover was the utility for installing and removing them. Fonts and desk accessories have since moved out of the System Folder and into folders of their own, but Font/DA Mover is still useful, especially if you use a utility such as Suitcase or MasterJuggler. Font/DA Mover 4.1 and later versions are compatible with System 7 and TrueType fonts. The program is available through on-line services and user groups and is included with many utilities and font-oriented products.

To start Font/DA Mover, double-click its icon. A list of fonts installed on the current start-up disk appears in the left-hand list box. (To see desk accessories instead, press and hold Option as Font/DA Mover opens.) The instructions in this box also apply to desk accessories.



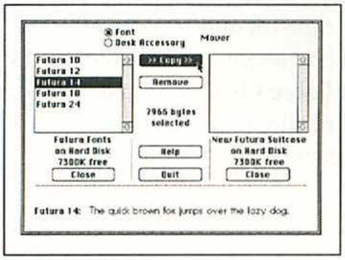
7966 bytes selected

Futura Fonts on Hard Disk 7316K free

Futura 14: The quick brown fox jumps over the lazy dog.

To remove a font from a suitcase file:

1. **Select its name.**
   Font/DA Mover tells you how much space it uses.
2. **Click Remove.**
   Font/DA Mover asks if you're sure you want to remove the selected item.
3. **Click OK.**



7966 bytes selected

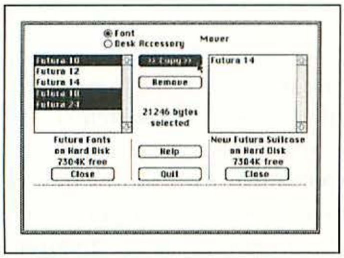
Futura Fonts on Hard Disk 7300K free

New Futura Suitcase on Hard Disk 7300K free

Futura 14: The quick brown fox jumps over the lazy dog.

To copy a font to a new font suitcase file:

1. **Click the Open button under the right list box.**
2. **Click the New button that appears in the file list box.**
3. **Type a name for the new font suitcase file and then click Create.**
4. **Select the font to be copied, and then click the Copy button.**



21246 bytes selected

Future Fonts on Hard Disk 7304K free

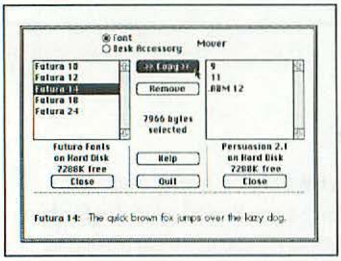
New Futura Suitcase on Hard Disk 7304K free

To copy a font to an existing font suitcase file:

1. **Open the font suitcase file by clicking the Open button and then double-clicking the file's name in the Open dialog box that appears.**
   The names of the fonts in that file appear in the list box.
2. **Select the font to be copied and click OK.**
   The font is packed in the suitcase with the others.

(continued on the next page)

(continued from the previous page)



7966 bytes selected

Futura 14: The quick brown fox jumps over the lazy dog.

To install a font in an application program:

1. **Press and hold the Option key while clicking the Open button.**
2. **Locate the application that will hold the font and then double-click its name.**
3. **Select the font to be copied and then click Copy.**
   You can also remove, copy, or install more than one font at once by Shift-clicking on each font.

Navigation utilities let you streamline the Mac's operation to suit your work habits and preferences. For creating keyboard shortcuts and automating repetitive tasks, use a *macro* or *keyboard enhancement* utility such as Affinity Microsystems' Tempo II Plus or CE Software's QuicKeys. Both let you record and play back keystrokes and mouse movements, and QuicKeys also lets you choose from a roster of built-in shortcuts, such as scrolling to the beginning or the end of a document. I discuss these and other automation utilities in greater detail later in this chapter.

If you prefer mouse clicking to key stroking, consider CE Software's Tiles or Binary Software's Square One, which let you create palettes containing the icons of frequently used documents and programs.

If you frequently quit one program and start another, there's Icom Simulations' On Cue II. On Cue II adds a menu to the right edge of the menu bar in which you can add the names of frequently used applications and documents, and then open them by simply choosing their names. You can even configure On Cue II to display its menu at the mouse pointer's location when you click the mouse while pressing ⌘ and Option — a boon for large-screen users who get tired of making the long trip to the menu bar.

Expanding the Apple Menu

As I described in Chapter 23, System 7's Apple menu is a great place to stash frequently used documents or programs (or, better still, aliases for those items). Microseed's HAM, Now Software's Now Utilities, and Alsoft's Menu Extend (part of the Alsoft Power Utilities package), make the Apple menu even more powerful by enabling it to display hierarchical menus. Put an alias of a folder in your Apple Menu Items folder, and the utility turns the folder's contents into a hierarchical menu that gives you one-click access to anything within the folder — including nested folders.

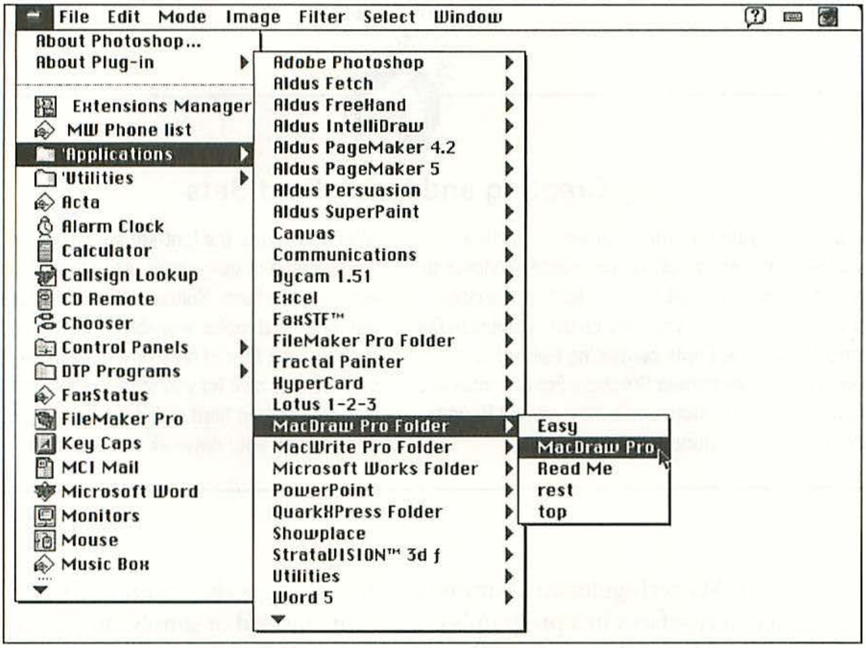


Figure 25-2: Apple Menu Orchard With an Apple menu extender utility, your Apple menu can display hierarchical menus showing the contents of folders or folder aliases within the Apple Menu Items folder.

Figure 25-2 "Apple Menu Orchard" shows how I use an Apple menu expander to get fast access to more than two dozen application programs.

Managing System Resources

Fond of fonts? Silly about sounds? If so, you're a candidate for a *resource manager* such as Fifth Generation Systems' Suitcase II or AlSoft's MasterJuggler (part of the Alsoft Power Utilities package). Also called *font/DA extenders*, these godsends make it easier to switch between sets of fonts. They work with other types of system resources, too, such as FKEYs and digitized sounds.

Without a resource management utility, installing and removing fonts means dragging them into and out of the System Folder's Fonts folder (or the System file, if you're using System 7.0). With a resource management utility, you keep the System Folder closed and add or remove fonts using the utility's Open and Close commands.

QUICK TIPS

Creating and Using Font Sets

To streamline your font-management life with a resource-management utility, use Font/DA Mover to create suitcase files that hold the font combinations you use. For example, you may create a suitcase file named Newsletter Fonts containing Galliard and Helvetica, another named Brochure Fonts containing Avant Garde and Caslon, and a third named Reports Fonts containing Futura and Garamond.

After you create the font-set suitcases, you can use the resource-management utility to switch between each set in a flash. Suitcase II and MasterJuggler can also open and make available fonts stored elsewhere, such as on a shared hard disk or network file server. Both utilities also let you store your PostScript outline files on a shared hard disk or file server, where everyone on your network can use them.

Both MasterJuggler and Suitcase II offer other goodies. Suitcase II can display the actual typefaces in a program's Font menu, instead of simply showing font names in the Mac's Chicago font. (Now Software's Now Utilities does this, too.) MasterJuggler lets you assign a sound to any of nine events, such as inserting or ejecting a disk. (A shareware extension called SoundMaster, by Bruce Tomlin, also does this. It was described along with some other sound-related utilities in Chapter 22.) And both Suitcase II and MasterJuggler can compress fonts and sounds so they take up less disk space. When a compressed font or sound is needed, the utility automatically decompresses it while loading it into memory, leaving the compressed version intact on your disk.

Suitcase II and MasterJuggler were developed long before System 7 as alternatives to grappling with Font/DA Mover. Because System 7 makes it easy to add and remove fonts, many people thought resource-management utilities would become obsolete. Far from it — they're still extremely useful for anyone who frequently switches between sets of fonts.

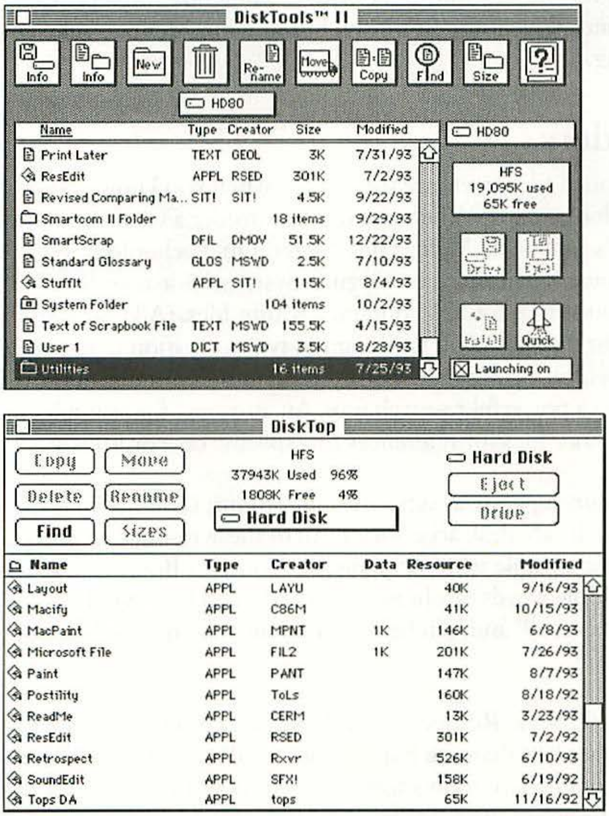
Lost in Disk Space

Hard disks can be hard work. It's great having megabytes of fast storage on tap, but as a hard disk fills up, managing its contents becomes increasingly difficult.

File finders

Fortunately, an entire class of utilities is devoted to simplifying life for hard-disk owners. Take a common problem — the inability to locate a file that you know is sitting somewhere on your hard drive. The Mac's Find command is handy, but its file-locating features are minimal compared to those of disk managers such as CE Software's DiskTop, Fifth Generation Systems' DiskTools (part of the MacPak package), Aladdin Systems' Shortcut, and Working Software's Findswell.

DiskTop and DiskTools are desk accessories that mimic many functions of the Finder (see Figure 25-3 "Surrogate Finders"). Both let you copy, rename, and delete files, as well as start programs and open documents. Both also let you search for files according to a variety of criteria — indeed, a wider variety than the Finder allows.



HFS
19,095K used
65K free

Name	Type	Creator	Size	Modified
Print Later	TEXT	GEOL	3K	7/31/93
ResEdit	APPL	RSED	301K	7/2/93
Revised Comparing Ma...	SIT!	SIT!	4.5K	9/22/93
Smartcom II Folder			18 items	9/29/93
SmartScrap	DFIL	DMOV	51.5K	12/22/93
Standard Glossary	GLOS	MSWD	2.5K	7/10/93
StuffIt	APPL	SIT!	115K	8/4/93
System Folder			104 items	10/2/93
Text of Scrapbook File	TEXT	MSWD	155.5K	4/15/93
User 1	DICT	MSWD	3.5K	8/28/93
Utilities			16 items	7/25/93

HFS
37943K Used 96%
1808K Free 4%

Name	Type	Creator	Data	Resource	Modified
Layout	APPL	LAYU		40K	9/16/93
Macify	APPL	C86M		41K	10/15/93
MacPaint	APPL	MPNT	1K	146K	6/8/93
Microsoft File	APPL	FIL2	1K	201K	7/26/93
Paint	APPL	PANT		147K	8/7/93
Postility	APPL	ToLs		160K	8/18/92
ReadMe	APPL	CERM		13K	3/23/93
ResEdit	APPL	RSED		301K	7/2/92
Retrospect	APPL	Rxvr		526K	6/10/93
SoundEdit	APPL	SFX!		158K	6/19/92
Tops DA	APPL	tops		65K	11/16/92

Figure 25-3: Surrogate Finders Fifth Generation Systems' DiskTools (top) and CE Software's DiskTop (bottom) enable you to manage disks, start programs, search for files, and open documents without having to return to the Finder.

With DiskTop, for example, you can search for all text-only files larger than 10K created by a program other than Microsoft Word between January 1 and January 15. Both programs provide some navigation benefits, too, enabling you to quit one program and start another without returning to the Finder. (A scaled-down but still very useful version of DiskTop is included on the *Macworld Complete Mac CD* included with this book.)

Shortcut and Findswell offer an even more convenient way to locate files. Both utilities are extensions that modify the standard Open dialog box all Mac programs use — a logical place to put file-searching features (unless you need to locate a file when using the Finder, whose Open command doesn't display the standard dialog box). Findswell adds a small button; click it, and a dialog box for searching appears. Shortcut turns the disk name that appears above the Eject and Drive buttons into a menu whose commands let you search for files, create new folders, and more.

You can find similar dialog box enhancers in two other utility packages. Symantec's Norton Utilities for the Macintosh includes a dialog box enhancer called Directory Assistance, and Now Software's Now Utilities includes one called SuperBoomerang.

Phrase finders

The aforementioned file ferrets are useful only when you know part or all of the filename you're looking for. When you don't, consider a text-retrieval utility such as Alki Software's Alki Seek, Microlytics' Gofer, On Technology's On Location, Claris Clear Choice Retrieve It!, or Virginia Systems' Sonar or Sonar Professional. These utilities can search for text contained within files. (Alki Seek and Retrieve It! can also search for files based on their names, types, creation dates, and other attributes.) Besides offering another way to locate lost files, a text-retrieval utility can turn the Mac into a powerful research tool. An attorney, for example, may use one to search case-history files for references to a specific case or litigant.

The Sonar programs operate as separate applications; Gofer, Alki Seek, On Location, and Retrieve It! are desk accessories. All of these utilities let you perform simple searches for a single word or phrase, or complex Boolean searches, in which you separate multiple words or phrases with OR, AND, or NOT, as in: "locate all files containing 'baseball' and 'pitcher' or 'football' and 'quarterback' but not 'hockey' and 'goalie.' "

Because Gofer, Alki Seek, Retrieve It!, and On Location work as desk accessories, they're more convenient than the Sonar series for day-to-day use. The Sonar programs, however, offer more sophisticated searching features. Sonar Professional, in particular, is the program of choice for serious researchers. It can assemble an index of words and phrases, search for synonyms, and even search for words that are within a certain distance of other words such as each occurrence of *trade* that appears within five words of *deficit.*

Partitioning utilities

Another way to tame a hard disk's frontiers is to use a *partitioning utility.* Partitioning utilities let you divide a hard disk's capacity into two or more *logical volumes,* each of which is treated as a separate disk that you can electronically insert and eject. Partitioning can be especially useful with high-capacity hard drives. For one thing, you can assign passwords to partitions to secure parts of the hard drive.

Perhaps equally important, you can ensure that you are using the drive's space efficiently. Here's why: When you save a file, the Mac's system software allocates disk space in chunks called *blocks.* The larger the drive, the larger each block. On a 150MB drive, a block is 2.5K, on a 300MB drive, it's 5K, and on a 600MB drive, it's 9.5K.

Even if a file contains only one character, it's given an entire block. (Depending on the structure of the file, it may get two blocks.) If you store lots of small files on a high-capacity drive, you waste a great deal of disk space. Creating a number of smaller partitions, each of which will use smaller block sizes, solves this problem.

Disk optimizers

As you use a hard disk, its contents become fragmented — scattered across separate areas of the disk. Defragmentation utilities, also called disk optimizers, keep a hard disk running at top efficiency by rearranging its contents so that all files are stored contiguously. Symantec's Norton Utilities for the Macintosh, Fifth Generation's Public Utilities, and Central Point's MacTools Deluxe offer this feature. Alsoft's DiskExpress II is another popular disk optimizer, and is included with the Alsoft Power Utilities package. (It's also available separately.)

Backup utilities

Organizing a hard disk is one thing; keeping its files safely backed up is another. Backing up a hard disk involves copying its contents to another storage medium — usually to a dozen or so floppy disks. It's drudgery, to be sure, but you can make the process tolerable by using a *backup utility* such as Dantz Development's Retrospect or DiskFit series, Inline Design's Redux, or Fifth Generation Systems' Fastback series. With a backup utility, you start by backing up the entire hard disk, inserting fresh floppies when necessary. After that, run the utility at regular intervals (every day or so) to back up new or modified files.

Chances are your backup routine will be as simple as the one I just described. You may, however, want to take advantage of the remarkable array of backup options that some programs — particularly Retrospect and Fastback Plus — provide. With Retrospect, for example, you can click on an on-screen calendar to specify backup intervals — once a week, every day, every other day, and so on. Subsequently, Retrospect automatically backs up your work at the specified intervals.

File recovery utilities

Even if you back up religiously, you'll probably lose a file now and then. You may trash one by mistake or encounter a damaged disk between backups. At such times, you need a file-recovery utility such as Symantec's Norton Utilities for the Macintosh, Fifth Generation's Public Utilities, or Central Point Software's MacTools Deluxe or Safe & Sound. By working intimately with the technical information that the Mac relies on to keep track of files, these wonder workers can often (though not always) recover deleted files or files stored on damaged disks.

Disk backup and recovery programs are complex enough to warrant a separate chapter. I take a closer look at these utilities and the concepts behind disk backup and disk maintenance in Chapter 27.

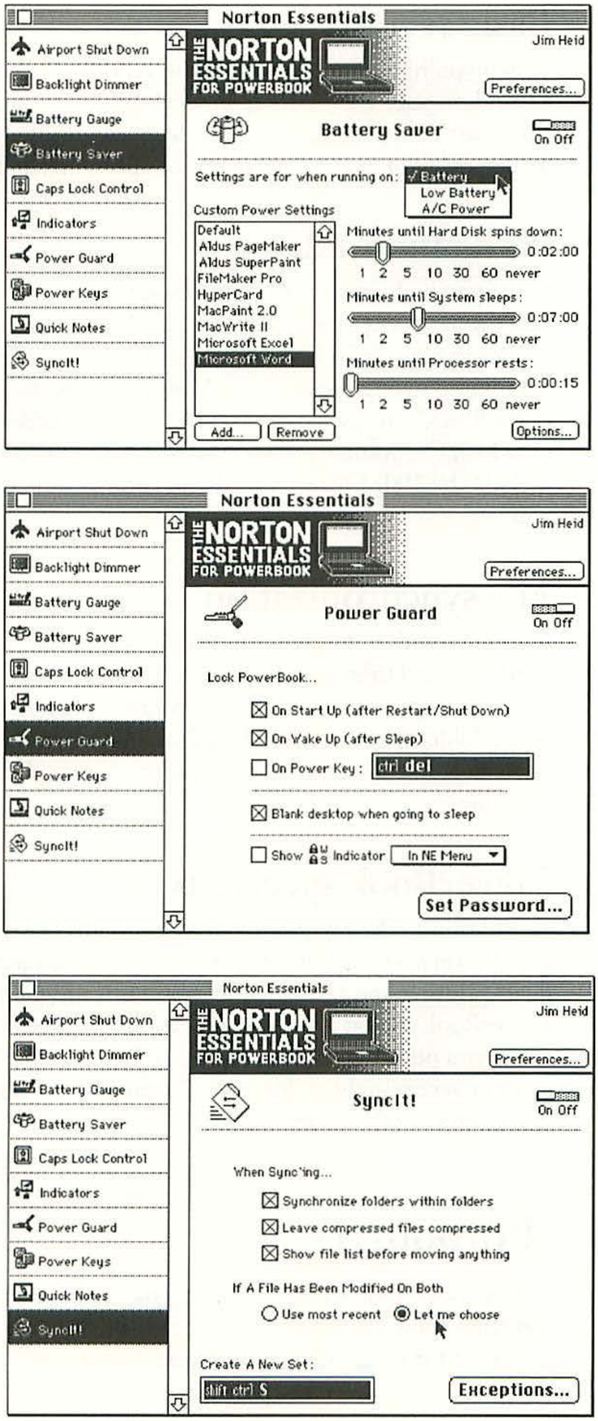
Utilities to Go

The members of the PowerBook family can benefit from every class of utility described in this chapter. (A screen saver can't save a PowerBook's screen any more than it does a desktop Mac's, but you may like the distraction. See the "Screen savers" section later in this chapter for more details.)

But PowerBooks can also benefit from several types of utilities designed for their unique requirements — and quirks. The most popular PowerBook utilities are utility collections such as Symantec's Norton Essentials for PowerBooks (NEP), Connectix's Connectix PowerBook Utilities (CPU), Claris Clear Choice's Power To Go, and Inline Design's PB Tools (see Figure 25-4 "PowerBook Utilities"). Each package is unique, but all share some common features.

Better battery-saving options

As I described in the previous chapter, the PowerBook control panel lets you extend a battery charge by specifying that the hard drive spin down and the PowerBook go to sleep after a predetermined amount of time. PowerBook utility packages take this concept to its limit by letting you specify separate sleep settings for each program you use.



Battery Saver

Settings are for when running on: ✓ Battery / Low Battery / A/C Power

Custom Power Settings

Default
Aldus PageMaker
Aldus SuperPaint
FileMaker Pro
HyperCard
MacPaint 2.0
MacWrite II
Microsoft Excel
Microsoft Word

Minutes until Hard Disk spins down: 0:02:00 (1 2 5 10 30 60 never)

Minutes until System sleeps: 0:07:00 (1 2 5 10 30 60 never)

Minutes until Processor rests: 0:00:15 (1 2 5 10 30 60 never)

Power Guard

Lock PowerBook...

☒ On Start Up (after Restart/Shut Down)

☒ On Wake Up (after Sleep)

☐ On Power Key : ctrl del

☒ Blank desktop when going to sleep

☐ Show Indicator In NE Menu

SyncIt!

When Sync'ing...

☒ Synchronize folders within folders

☒ Leave compressed files compressed

☒ Show file list before moving anything

If A File Has Been Modified On Both

○ Use most recent ● Let me choose

Create A New Set: shift ctrl S

Figure 25-4: PowerBook Utilities Symantec's Norton Essentials for PowerBook lets you fine-tune sleep settings (top) to extend battery life, specify security settings (middle) to protect the PowerBook from curious eyes, and specify file-synchronization settings (bottom).

Basic security

When you're on the road but out to lunch, you don't want someone snooping around on your PowerBook. PowerBook utility packages let you specify a password that must be typed before a sleeping PowerBook wakes up. All packages also offer quick power-on features designed to speed up hand inspections at airports.

Navigation aids

Some people have trouble with PowerBook trackballs and prefer using the keyboard whenever possible. Most PowerBook utility packages provide enhanced keyboard navigation features that let you use the keyboard to choose menu commands and dialog box options. Most packages also have features that enlarge the PowerBook's mouse pointer — ideal for PowerBooks with passive-matrix screens on which the pointer can be hard to see. (Examples of passive-matrix PowerBooks include the 100, 140, 145, 145B, and 160 as well as the PowerBook Duo 210 and 230.)

File synchronization

If you use both a PowerBook and a desktop Mac, you've probably scratched your head now and then wondering which machines' files are the most recent. File-synchronization utilities can save your scalp by automatically updating the contents of the folders you specify. Most PowerBook utility packages include file-sync software. Separate syncing programs such as Inline Design's Inline Sync are also available.

PowerBook specialists

In addition to the Swiss army knife packages I've described here, there are specialized PowerBook utilities such as Palomar Software's On The Road, which lets you defer printing and faxing while you're traveling. On The Road lets you set up your PowerBook so that it recognizes various locations — home, office, motel room — when you power on or wake up your PowerBook. On The Road then adjusts key settings accordingly — for example, turning off AppleTalk when you're not connected to the office network.

Utility Potpourri

Before moving on to take a closer look at macro utilities and other advanced customizing tools, here's a quick roundup of some of the other types of utilities that are vying for your memory and hard disk space.

Screen savers

These popular utilities blank the Mac's screen after a specified period of inactivity, supposedly to prevent an image from being burned into the monitor's phosphor coating. The fact is, the phosphor in today's monitors is virtually immune to burn-in. Still, screen savers do provide a fun diversion, especially when they're as entertaining as the popular After Dark, from Berkeley Systems. (If you've seen toasters flying across a friend's screen, you've seen After Dark.) Fans of *Star Trek* will want Berkeley Systems' Star Trek: The Screen Saver, which contains over 15 animated displays — the Enterprise bridge, Klingon battle cruisers, and even tribbles. Screen savers may not save your monitor, but if they give you a few laughs during the day, they may help save your sanity.

Clipboard enhancers

These utilities add features or conveniences to the Mac's Clipboard data-exchange mechanism. Portfolio Software's SmartScrap provides more features than Apple's Scrapbook desk accessory, including support for multiple scrapbook files and a thumbnail view that shows multiple scrapbook pages in one window. Olduvai's MultiClip provides multiple Clipboards, each of which is editable.

Font utilities

These streamline the way the Mac works with fonts. Foremost among them is Adobe's Adobe Type Manager (ATM), which uses PostScript outline font files to provide tack-sharp screen fonts at any size — no jagged-edged type if you choose a size that doesn't exist in your System Folder. ATM also lets you use PostScript printer fonts with non-PostScript printers such as GCC's PLP series and Apple's StyleWriter family.

Adobe's SuperATM uses technology based on that of Adobe's Multiple Master fonts to simulate fonts that aren't present in your system. Adobe's Adobe Type Reunion sorts and organizes fonts by family names, eliminating Font menus that sag to the bottom of the screen.

Jim Lewis' free theTypeBook program is one of several utilities that let you quickly create font-specimen books that graphic designers and desktop publishers rely on to help them choose typefaces. (You can find a copy of theTypeBook on the *Macworld Complete Mac CD* included with this book.)

And don't forget the numerous font-modification utilities covered in Chapter 12.

Screen capture utilities

These replace the Mac's feeble ⌘-Shift-3 FKEY by providing a slew of options for saving a screen image on disk. Programs such as Mainstay's Capture, Sabastian Software's Image Grabber, and Wildflower Software's SnapJot let you copy part or all of the screen — including pulled-down menus — to the Clipboard or save it as a disk file.

Workgroup utilities

These let you turn LocalTalk network cabling into a medium for coworker communication and brainstorming. If you're only using LocalTalk cables to connect Macs to laser printers, you're wasting your wires. Farallon Computing's remarkable Timbuktu lets you control one Mac from another Mac on the network (or even from a DOS PC running Microsoft Windows), or simply observe how others are using their Macs. It's also ideal for transferring files between machines. CE Software's In/Out lets you keep track of who's in the office: It's an electronic version of the message boards many offices use. Mainstay's MarkUp enables group editing of documents as they journey through the approval loop: It's an electronic red pencil that works on local networks. Portfolio's SuperGlue provides document-annotation features, too.

Spoolers

These make the long wait for a slow printer less annoying by intercepting and storing documents on disk and then sending them to the printer as it becomes available. Although you won't get your output any faster, at least your Macintosh won't be tied up, leaving you waiting while files print. System 7 and System 6 MultiFinder provide this *background printing*, too, but their features fall short of those provided by SuperLaserSpool.

For example, the Mac's PrintMonitor application doesn't let you rearrange the order of pending print jobs; SuperLaserSpool's LaserQueue desk accessory does. SuperLaserSpool also lets you redirect a job to a different printer — handy for those times when you send a file to a printer and then discover that a colleague has just sent a 75-page report to the same printer. You can also use cut and paste buttons in SuperLaserSpool's LaserQueue window to remove your document from the printer's queue and then paste it into the queue of a printer that isn't busy at the moment.

SuperLaserSpool also sports a print preview feature that lets you save paper by seeing how a document will look when printed, and a notification alert option that displays a message when a print job is complete.

See Chapter 32 for information on additional printer utilities.

File transfer and translation utilities

Programs such as DataViz's MacLink Plus/PC and Traveling Software's LapLink Mac bridge the gap between the Mac and the world of DOS PCs and Windows. Both include a cable and software for your Mac and PC. (I look at these file-translation utilities in greater detail in Chapter 28.) If you work with 3½-inch DOS disks, consider Dayna Communications' DOS Mounter Plus or Apple's own PC Exchange. Both are extensions that let you insert 3½-inch PC disks in a SuperDrive and work with them using the Finder.

File-compression utilities

Programs such as Aladdin Systems' StuffIt Deluxe and the shareware StuffIt Classic and Compact Pro let you compress files so they use less disk space. They're priceless for archiving lesser-used files and for sending and receiving files via modem. Fifth Generation's Disk Doubler is another popular file-compression utility. (Aladdin's StuffIt Lite is on the *Macworld Complete Mac CD* included in this book.)

A new generation of file-compression utilities provides its benefits on-the-fly, as you use your Mac. Programs such as Aladdin's StuffIt SpaceSaver (included with StuffIt Deluxe) and Fifth Generation's AutoDoubler automatically compress and decompress files as you work, effectively boosting your hard disk's capacity. On the down side, on-the-fly compression utilities can slow down the Mac and make it difficult to recover damaged files.

A variety of commercial and shareware disk-cataloging utilities is also available to help you keep track of what's on your disks (you'll find one on the CD in the Best of BMUG collection). Several labeling programs are available that read disks you insert and then generate labels that you can print on Avery peel-and-stick label stock.

Security utilities

These software security guards protect your Mac and its data from curious eyes and nefarious spies. To keep wandering hands off your Mac, consider an access-protection utility such as Casady & Greene's Access Managed Environment (AME) or Kensington's PassProof, both of which let you electronically lock the keyboard, screen, and mouse.

File-encryption programs such as Datawatch Corporation's Citadel scramble documents according to a password you supply. (Compression utilities such as StuffIt Deluxe also enable you to assign passwords to archives.) Disk-security programs such as Kent-Marsh's FolderBolt let you protect files and folders against modification, unauthorized access, and deletion.

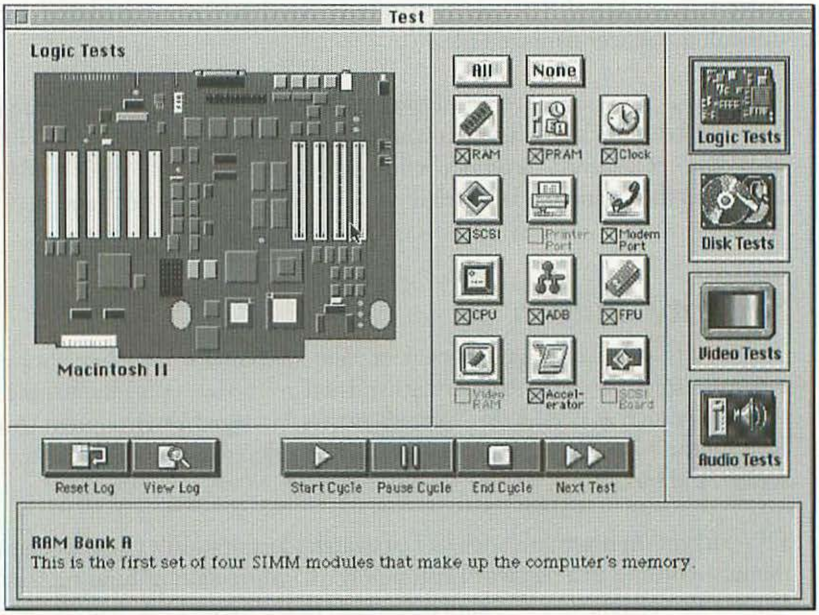
Diagnostic and virus-detection utilities

Not sure if your Mac is healthy? Utilities such as Maxa's Snooper may be able to help by testing your system's memory chips and other components (see Figure 25-5 "Just Snooping"). Maxa's Alert! and Casady & Greene's Conflict Catcher are designed to pinpoint conflicts between system extensions — a problem every utility buff has encountered at least once.

Programs such as Symantec's SAM, Datawatch's Virex, and John Norstad's Disinfectant help guard against a virus attack. (Viruses and virus-detection utilities are covered in Chapter 27.)

Network utilities

An office network is like a freeway: When a problem develops, traffic slows down for everyone. An entire class of utilities is designed to help you troubleshoot network problems and analyze network traffic. Network analysis programs such as Farallon Computing's TrafficWatch II spy on the data packets that form network traffic, enabling you to determine where problems exist and whether your network wiring scheme can handle the amount of traffic on the network.



RAM Bank A
This is the first set of four SIMM modules that make up the computer's memory.

Figure 25-5: Just Snooping Maxa's Snooper diagnostic utility can test dozens of components. It's also a fun way to learn more about your Mac: When you point to a component on the on-screen logic board, Snooper describes its purpose.

Programs such as Dayna Communications' Network Vital Signs and AG Group's Net WatchMan can notify you when a problem, such as a crashed mail server, occurs. Both programs can even contact you over a wireless pager. ("Sorry, fellas — you'll have to play the last few holes without me — the file server just went down.")

For an introduction to networking, see Chapter 33. For a detailed look at network utilities and networking issues, see *Macworld Networking Handbook* (IDG Books Worldwide, 1992).

Extension managers

These handy utilities let you selectively disable extensions without having to drag them out of the System Folder. Popular extension managers include CE Software's Aask (part of the MockUtilities package) and Inline Design's INITPicker. Baseline Publishing's Startup Commander is the most ambitious extension manager: Among other things, it lets you specify that certain extensions be loaded only under certain conditions (for example, if AppleTalk is turned on, the utility loads the AppleShare extension).

I use a free extension manager called Extension Manager, created by Apple's Ricardo Batista. You can get a copy through a user group or on-line services such as CompuServe and America Online.

Utilities that let you manage utilities — now that's the sign of a thriving marketplace. There's no shortage of utilities for the Macintosh, and that's proof of a few things — the gaps still present in the Mac's system software, the vitality of the Mac itself, and most of all, the desire of Mac users to personalize and customize their machines.

Focus on Macros and Scripting

I touched on macro utilities earlier in this chapter. This section provides more details on QuicKeys and Tempo II and also discusses Apple's own AppleScript.

Macro basics

In its simplest form, creating a macro involves choosing a recording command, performing some activities, and then choosing a stop recording command. When you play back the macro, the Mac goes into autopilot while you go do something else.

Programs that let you record and play macros have been available for years: The two veterans are Affinity Microsystems' Tempo II Plus and CE Software's QuicKeys. But these utilities are being joined by a new generation of macro tools that provide finer control over the Mac by enabling you to create scripts — sequences of events that you can not only play back, but edit and embellish. In its most advanced form, creating scripts is a lot like programming. A script can contain *if...then* options that enable it to play back different steps depending on certain conditions: "If I've created any files that haven't been backed up today, run my backup program and then shut down. Otherwise, just shut down."

Macro and scripting features are built into a growing number of application programs, including Microsoft Excel and Works, ClarisWorks, Lotus 1-2-3, Aldus PageMaker, WordPerfect, and FileMaker Pro. But the latest word in Mac automation is Apple's own AppleScript, an enhancement to System 7 that lets you create scripts that control the Mac's Finder as well as application programs that support AppleScript. In this section, I spotlight AppleScript's benefits and show how it relates to QuicKeys and Tempo II Plus and to the built-in macro and scripting features many programs provide. For some ideas on how to put macros to work, see the Quick Tips box "Using Macros."

QUICK TIPS

Using Macros

Here are just a few of the ways you can put macros to work.

Create custom keyboard shortcuts

A macro doesn't have to perform step-after-step. One of the most common uses for a macro product like QuicKeys is to create keyboard shortcuts that start programs, choose menu commands, and select icons on tool palettes or buttons in dialog boxes. It's a great way to put an extended keyboard's 15 function keys to work.

Streamline system adjustments

If you frequently switch between various monitor settings, network printers and file servers, or other control panel or Chooser-related options, you can set up macros that automate the process. QuicKeys is especially handy for this: It includes an entire category of macro options designed to cut down on trips to the Control Panels folder.

Simulate word-processor style sheets or glossaries

Powerhouse word processors such as Microsoft Word have style-sheet features that automate repetitive formatting, and glossary features that let you store and recall often-used text (see Chapter 3). Most other programs lack these features, but you can simulate them by creating macros that choose the desired font and formatting commands, or insert often-used text.

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Automate search-and-replace or reformatting operations

Say you're a desktop publisher and one of your first steps in every job is removing the extra space that the folks in the typing pool always put after each sentence. Create a macro that chooses your word processor's Replace command, types two spaces in the Find What box and one space in the Replace With box, and then clicks Replace All. Similarly, if you frequently retrieve data from the company mainframe computer and then reformat it for importing into a database or spreadsheet, you can set up a macro that does the formatting and importing for you.

Batch-process files

Say you work with Adobe Photoshop and you always apply a certain filter to freshly scanned images. Many Photoshop pros do just that, applying the Unsharp Masking filter to newly scanned images to sharpen them up. You can set up a macro that automatically opens a file in a given folder, applies the filter, saves the file, and then proceeds to the next file.

Create a customized application

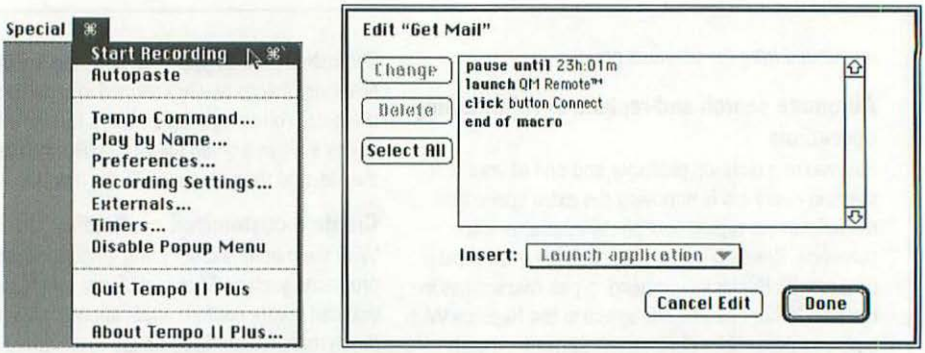
With the macro and scripting languages provided by programs such as Microsoft Excel and HyperCard, you can create custom applications that have pull-down menus and dialog boxes that prompt for information and enable users to choose various options. This is macro making at its most ambitious: Indeed, it's actually a form of programming.

Comparing QuicKeys and Tempo II Plus

With either of these utilities you can accomplish all aspects of Mac automation except creating a customized application, such as a billing program for your company. Although they share similar features, each takes its own approach to macro making.

Employing the "watch me" (recording your actions as you go) style of macro making I described earlier, Tempo II Plus adds a Command menu to the Mac's menu bar. To begin recording a macro, choose Start Recording from this menu, and then simply perform the steps you want to record: Choose a menu command, type some text, or click a button. When you're done, choose Stop Recording, and Tempo II Plus displays a dialog box for you to save the macro and give it a keyboard shortcut (see Figure 25-6 "In Tempo").

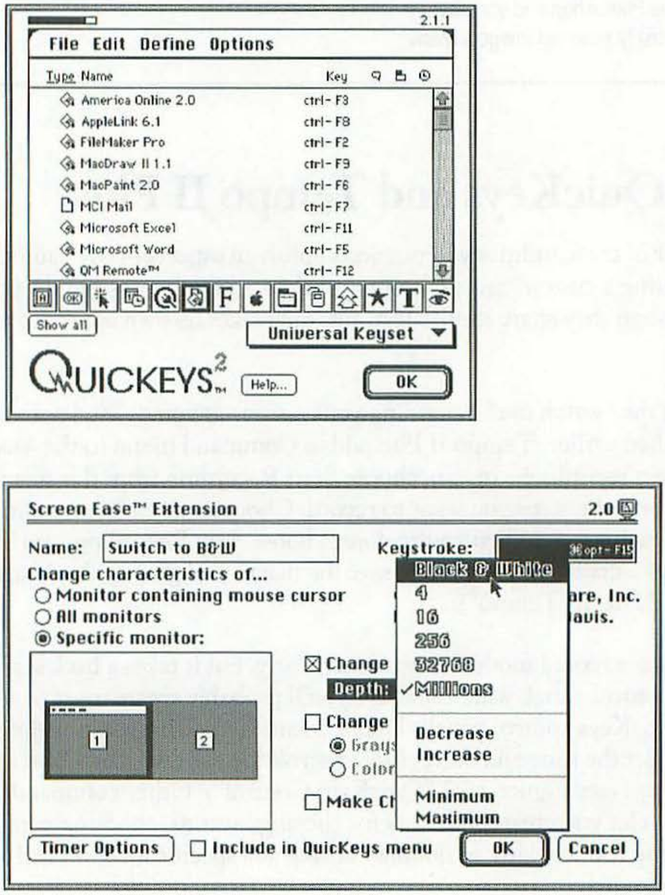
QuicKeys has a record mode that works similarly, but it takes a back seat to the QuicKeys control panel, which is where you'll probably create most of your macros. The QuicKeys control panel's Define menu is packed with predefined shortcuts that insert the time and date, close or scroll through windows, and adjust system settings (see Figure 25-7 "QuicKeys Control"). Other commands in the Define menu let you create shortcuts for clicking buttons, choosing menu commands, typing text, clicking or double-clicking at a specific location within a window, and much more.



pause until 23h:01m
launch QM Remote™
click button Connect
end of macro

Insert: Launch application

Figure 25-6: In Tempo Affinity's Tempo II Plus adds a Command menu (left) to the menu bar. You use this menu to record, play, and edit macros. This simple macro (right) waits until 11:01 pm when phone rates drop, and then runs an electronic mail program — in this case, QuickMail Remote — that retrieves any waiting correspondence.



Type Name	Key
America Online 2.0	ctrl-F3
AppleLink 6.1	ctrl-F8
FileMaker Pro	ctrl-F2
MacDraw II 1.1	ctrl-F9
MacPaint 2.0	ctrl-F6
MCI Mail	ctrl-F7
Microsoft Excel	ctrl-F11
Microsoft Word	ctrl-F5
QM Remote™	ctrl-F12

Name: Switch to B&W

Keystroke: ⌘opt-F15

Change characteristics of...
○ Monitor containing mouse cursor
○ All monitors
● Specific monitor:

☒ Change Depth: Millions
☐ Change
● Grays
○ Color
☐ Make Ch
☐ Include in QuicKeys menu

Figure 25-7: QuicKeys Control CE Software's QuicKeys control panel provides menus for creating new macros and lists ones you've already created. The macros shown here allow me to start often-used programs (top) by pressing the Control key along with a function key. QuicKeys' Screen Ease extension (bottom) is just one of many extensions that streamline making system adjustments. Screen Ease lets you switch between frequently used monitor settings without having to open the Monitors control panel. Here, Screen Ease is being set up to switch a monitor into black-and-white mode when ⌘-Option-F15 is pressed.

Advanced Macro Options

Both QuicKeys and Tempo II Plus let you create universal and application-specific macros. Universal macros, which work in any program, can be used to create keyboard shortcuts for scrolling, resizing windows, starting programs, or typing your name and address — tasks you're likely to perform in more than one program. To create a shortcut that you need in a particular program, use an application-specific macro, which is available only when that program is active.

Most people create keyboard shortcuts for their macros, but both Tempo II Plus and QuicKeys also provide menus that let you start macros using the mouse. Both programs also let you create icons that run macros when double-clicked. They even offer timing options that let you specify that a macro run at certain intervals.

Although macros are relatively simple to create, they may not always be problem free. A number of pitfalls can trip up a novice macro writer, but QuicKeys and Tempo II Plus provide detours around them. (For a guide to solving the most common macro maladies, see the Quick Tips box "Macro Troubleshooting Tips.") You get more reliable macros when you go beyond simply recording a series of events and start taking advantage of the "smart" features that QuicKeys and Tempo II Plus provide.

QUICK TIPS

Macro Troubleshooting Tips

Here's how to avoid the macro pitfalls you're most likely to encounter in Tempo II Plus and QuicKeys.

Problem: A file-opening macro you create by invoking your utility's Record command and then double-clicking a file's icon won't work if you subsequently move the icon; when Tempo II Plus or QuicKeys plays the macro, the Mac double-clicks the wrong icon or no icon at all.

Solution: Specify which file or program you want a macro to open. In Tempo II Plus, choose Options from the command menu and click either the Launch Application or Launch File button, and then choose the program or file you want the macro to open. In the QuicKeys control panel, choose File from the Define menu and then select the desired program or document.

Problem: Macros that choose menu commands can fail if a program changes its menu wording as it operates. (For example, most word processors have a Show Ruler command that changes to read Hide Ruler when the ruler is visible.)

Solution: Tell the macro program to choose the command based on its position within a given menu rather than on its wording.

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Problem: A macro that clicks a check box within a dialog box can fail if the box is already checked when the macro runs.

Solution: Enable Tempo II Plus's Smart Check Boxes option (in the Preferences dialog box) before recording the macro. In QuicKeys' Button dialog box, select the Only Click If Button Is Off option.

Problem: A macro that clicks a tool in a palette can fail if you move the palette elsewhere on the screen.

Solution: Be sure Tempo II Plus's Enable Smart Features button is selected when recording the macro. In QuicKeys, use the Click Location dialog box to tell QuicKeys to click relative to the document window.

Problem: The macro utility may appear to skip some steps when playing back a multistep macro.

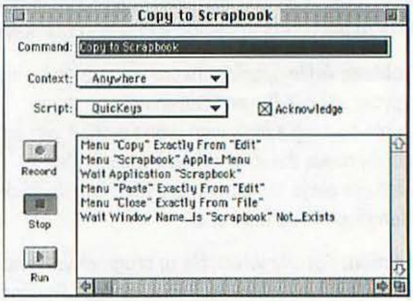
Solution: Add pauses between the steps. Use the Pause command in QuicKeys' Define menu or the Pause for Interval command in Tempo II Plus.

So which macro utility should you use? I'm partial to QuicKeys. For the simple macros I create — menu command and scrolling shortcuts, file-opening macros — QuicKeys lives up to its name. But Tempo II Plus does have the edge when it comes to creating complex macro sequences whose playback depends on certain conditions being met. QuicKeys' *if...then* capabilities are more limited.

QUICK TIPS

Voice Macros: QuicKeys and PlainTalk

If you have an AV Mac such as a Centris 660AV or Quadra 840AV, you can create macros that are triggered by spoken commands. In the adjacent figure, the Speech Macro Editor is being used to create a macro that copies some selected text or graphics, opens the Scrapbook, and then pastes the selection into the Scrapbook. The macro runs when you say, "Copy to Scrapbook."



Command: Copy to Scrapbook

Context: Anywhere

Script: QuicKeys

☒ Acknowledge

```
Menu "Copy" Exactly From "Edit"
Menu "Scrapbook" Apple_Menu
Wait Application "Scrapbook"
Menu "Paste" Exactly From "Edit"
Menu "Close" Exactly From "File"
Wait Window Name_Is "Scrapbook" Not_Exists
```

The AV Macs also come with an extension for QuicKeys that lets you trigger QuicKeys macros with spoken commands.

The AppleScript Difference

QuicKeys and Tempo II must provide their smart features because application programs are dumb: They aren't designed to be operated by remote control. But what if an application was designed with automation in mind? What if it provided a vocabulary of explicit commands that a macro utility could use? The vocabulary would incorporate terms specific to the application — cells, ranges, and charts for spreadsheets, for example, fields and records for a database, paragraphs and words for a word processor, or clips and fades in a QuickTime video-editing program. When you performed specific tasks, the application program would "broadcast" messages describing what you did. A macro recorder could record these messages, resulting in a macro that provides explicit instructions instead of simply simulating mouse clicks and keystrokes.

Apple's AppleScript brings this kind of intelligence to the macro world. AppleScript builds on a System 7 mechanism called Apple events, which enables application programs to exchange commands and data. Previous chapters have looked at one aspect of Apple events — the publish and subscribe commands that let you create links between documents.

Three flavors of AppleScript support

But just as application programs must be designed to support publish and subscribe, so must they be written to work with AppleScript. Apple calls a program that supports AppleScript *scriptable.* A program can be scriptable on any of a few levels. A program that is *recordable* can work with a script editor utility to automatically create scripts as you work — much like Tempo II Plus or QuicKeys create macros by recording mouse clicks and keystrokes. You can still create scripts for a program that isn't recordable, but you have to do so by typing the script manually.

A program that's *attachable* enables you to assign, or attach, scripts to menu commands or to buttons or other on-screen elements. When you click or otherwise activate an element to which a script is attached, the script runs. You may use this feature to customize the way a certain program's Save command works — say, by adding a logging feature that tracks how much time you spent working with the file.

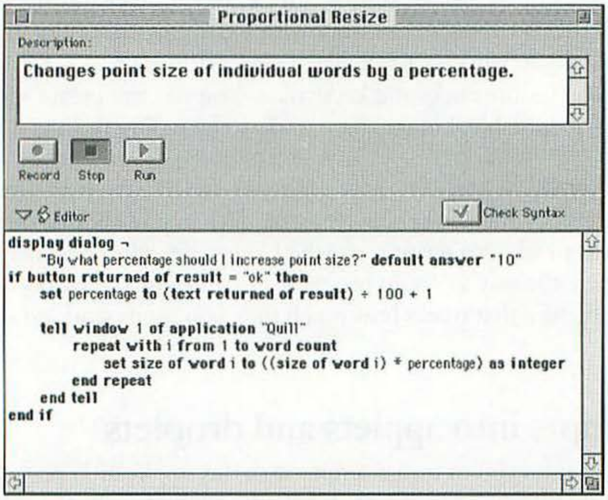
Forging scripts into applets and droplets

AppleScript also enables you to turn a script into a tiny application program that you can run directly from the Finder. Such a miniprogram is called an *applet.* You can also create a special type of applet, called a *droplet,* that acts like a drop box: You can drag icons for files, folders, or disks to the icon of a droplet, and the droplet runs and then performs some kind of operation on those icons. You may create a droplet that prints the files dragged to it, or creates aliases of them, or copies their names into a database, or duplicates them and then opens the duplicates.

AppleScript is included with System 7 Pro, which includes AppleScript documentation and a utility, called Script Editor, that lets you record, edit, and play back scripts (see Figure 25-9 "Apple Scripts"). System 7 Pro also includes a bare-bones word processor, called Scriptable Text Editor, that is recordable. You can use this program to experiment with the power of AppleScript until your favorite word processor is updated. You can also get an AppleScript developer's toolkit through APDA, Apple's source for developer tools (800/282-2732). The toolkit includes extensive technical documentation.

Recording a script

Recording a script using Script Editor isn't too different from recording a macro with Tempo II Plus or QuicKeys. Click Script Editor's Record button, and then switch to a recordable application program and perform the tasks you want to record. If you position your windows so you can see both the application and Script Editor, you can see script commands appear in the Script Editor's window as you work. When you've finished, you can save the script conventionally or as an applet or a droplet.



Description:

Changes point size of individual words by a percentage.

```
display dialog ¬
    "By what percentage should I increase point size?" default answer "10"
if button returned of result = "ok" then
    set percentage to (text returned of result) ÷ 100 + 1

    tell window 1 of application "Quill"
        repeat with i from 1 to word count
            set size of word i to ((size of word i) * percentage) as integer
        end repeat
    end tell
end if
```

Figure 25-8: Apple Script The Script Editor that accompanies Apple's AppleScript Developer's Toolkit and AppleScript Runtime Kit lets you record, play, and save scripts. The script shown here works with the Quill program that's included with the developer's toolkit. The script lets you change the type size of the text in a Quill document by specifying a percentage value.

With AppleScript, Apple has poured the foundation for heavy-duty scripting, but it's up to the architects and carpenters of the software world to build on it. Expect to see AppleScript support in a growing number of programs. Also expect to see more sophisticated script editors appearing from third-party utility makers such as UserLand, whose Frontier was the first scripting utility to take advantage of the power of Apple events. When AppleScript hits its stride, there will be no end to the slick ways you can put your Mac to work.

Hard-Core Customizing

If you're a hard-core customizer — the kind of person who putties posters to walls, makes substitutions at restaurants, replaces the buttons on new clothes, and has personalized license plates — you'll want a library of resource-editing utilities. These programs let you customize the way the Mac looks and operates by altering resources, which are small, structured tidbits of information the Mac uses as it runs.

You can perform two basic kinds of customizing tasks with a resource editor. The first involves making cosmetic changes — adding new beep sounds and altering the appearance of windows, scroll bars, dialog box buttons, the mouse pointer, the Trash can, and other icons. The second category involves functional enhancements — changes that actually alter the way the Mac or a certain program runs. You can add or change menu ⌘-key shortcuts, rephrase a dialog box message, add a custom page size to the ImageWriter's Page Setup dialog box, and tailor the way the Finder displays the contents of disks and folders.

This section presents some background on resources and their roles, spotlights some popular resource-editing utilities, and passes along several customizing ideas.

What are resources?

Resources let software developers create and store a program's user interface elements — its menus, dialog boxes, buttons, tool palettes, and so on — separately from the program's software code. This separation makes it easy for software developers to adapt, or *localize,* their programs for different countries. To create a version of a program for use in, say, France, a developer simply alters the program's resources, translating the English menus and dialog box text into French. Besides translating text into other languages, localizing also involves displaying date and currency values in the appropriate format. Without resources, a developer has to substantially change a program's code to adapt the program for another country. With resources, the job can be done in an afternoon by a nonprogrammer.

Resources are grouped by function into *resource types*, which have four-character names such as MENU and LAYO. Each resource is assigned an identification number within its resource type. This scheme makes it possible for resources of different types to have the same ID number — while those within the same group must have unique ID numbers.

When a program needs a given resource (for example, a "Save changes before closing?" dialog box), it requests the resource by its ID number from the Resource Manager, a portion of the Mac's system software whose job is finding and loading the appropriate resource when it's required.

Additional resource advantages

Another advantage of resources is that they can be shared by more than one program, adding consistency to the Mac's operation and saving disk space and memory by putting things all programs can use in a single place (often the System file). A font is a good example of a shared resource. (Incidentally, if you find a resource named WDEF, don't assume your Mac is infected with the virus of the same name. WDEF is a standard definition procedure for creating windows and a general resource located in the System file. See Chapter 27 for more details on viruses and virus-detection measures.)

Resources also enable the Mac to manage its memory more efficiently. A software developer can designate certain resources as *purgeable:* The Mac can clear them from memory when it needs the memory for other uses. When the Mac accesses your disk after you choose a rarely used command, it may be loading a resource that wasn't in memory. And chances are if you choose the same command again a moment later, the Mac won't access the disk, because the resource will still be present in memory. Resources enabled 128K and 512K Macs to run programs that otherwise wouldn't have fit in memory. Today's Macs have more memory, but resources still provide their memory-saving advantages. Table 25-1 lists and describes some resources that are ideal candidates for customizing.

Table 25-1
Customizing Candidates

Type	*Description*
ALRT	Template for an alert box's appearance
BNDL	Bundle — the Finder uses BNDL resources to associate files with their icons
CURS	Cursor — defines the appearance of a mouse pointer
DITL	Dialog item list — defines what appears in a dialog or alert box
DLOG	Template for a dialog box's appearance

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Table 25-1 (continued)

Type	*Description*
FKEY	Function key — a ⌘-Shift-number routine
FOND	Font family descriptor
FONT	Font bit map description
fmnu	Finder menu — contains special menu resources for System 7's Finder; you can edit these resources with ResEdit 2.1.1 or a later version
ICN#	Icon list — a series of icon definitions; generally used by the Finder to show icons in various states (active, inactive, hollow); application icons are ICN# resources
ICON	Icon — a single icon definition, like that of a printer driver you see in the Chooser
icl	Large color icon — System 7 version of cicn, made up of icl8 (8-bit) and icl4 (4-bit) icon resources
ics	Small icon — System 7 version of cicn, made up of ics4 and ics8 resources
INTL	International resource — contains data that an application uses to create displays appropriate to a given country (proper date formatting, currency symbols, and so on)
MBAR	Menu bar — defines all the menus in a menu bar
MENU	Defines an individual menu's commands and keyboard shortcuts
NFNT	Font in new-font-numbering-table format
PAT1	Pattern — defines a QuickDraw pattern (the patterns drawing and painting programs show in their palettes)
PAT#	Pattern list — a collection of patterns
PDEF	Contains printing software
PICT	Picture — the pictures that often appear when you choose an About command are usually PICT resources; also appear in Alarm Clock desk accessory and many control panels
ppat	Pixel pattern — used to generate desktop patterns
PREC	Print record — storage area for printer driver data
snd[1]	Sound resource — enables the Mac to play synthesized and digitally recorded sounds
STR[1]	String — a series of characters that may appear in a dialog box or be used by a program; for example, in an error message
STR#	String list — a collection of strings
SIZE	Contains memory-requirements information used by the Finder or System 6 MultiFinder
WDEF	Window definition — describes the appearance of a window
WIND	Window template — used by the Window Manager to create a window

(1) Each of these resources have a space after its name.

Resource Editing Software

Resources enable you to customize a program without having to be a programmer. If you double-click icons and choose menu commands, you can use the latest resource editing tools.

Caution: These are power tools. You can irreparably damage the file you're modifying if you make a mistake. To avoid disaster, always follow the Prime Directive of Resource Editing: Never modify your only copy of a program, system file, or document. Make a duplicate copy of the file and perform your surgery on the copy. And save your work often; most resource editors have a Revert command that lets you fall back on the previously saved version of a file.

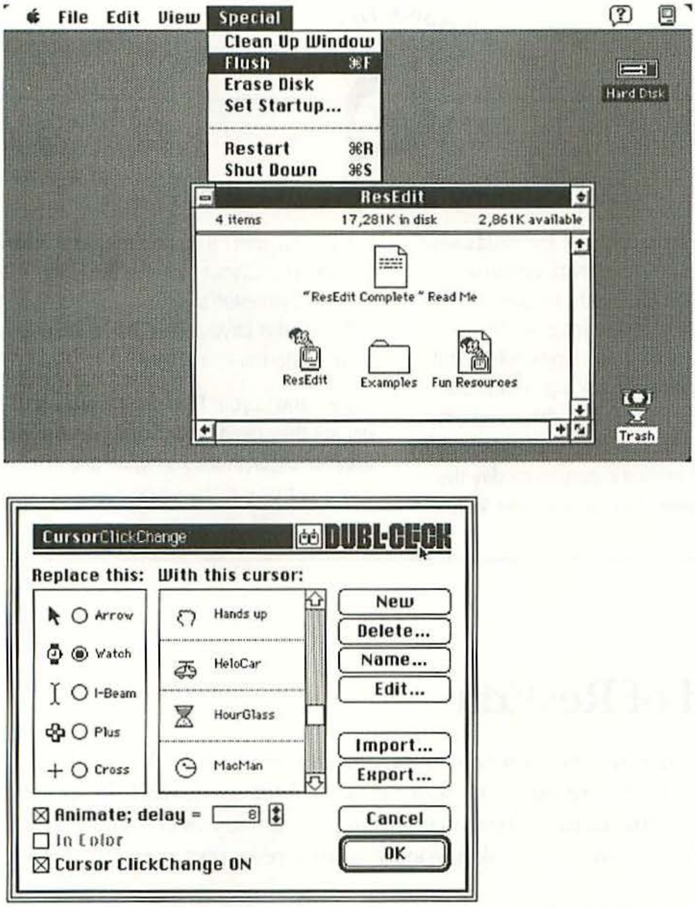
Giving your Mac an interface lift

For cosmetic customizing, try a shareware extension called Greg's Buttons, by Greg Landweber. Greg's Buttons replaces the standard black and white buttons, check boxes, and radio buttons with attractive, three-dimensional color ones that match System 7's windows and scroll bars. Greg's Buttons adds color to the stop sign, caution, and note alert icons.

For a more complete makeover, there's Dubl-Click Software's ClickChange. ClickChange enables you to change the appearance of the windows, scroll bars, dialog boxes, buttons, pointers, and more (see Figure 25-9 "Mac Makeover"). It also lets you assign colors to virtually every element of the Mac's interface.

ClickChange also works with digitized sounds, which are another type of resource. ClickChange lets you choose from a variety of new system beeps and assign sounds to different events, such as when you insert or eject a disk, drag or resize a window, or even press a key. The utility includes a typewriter sound that goes nicely with the latter option.

But the king of sound customizers is Bruce Tomlin's shareware SoundMaster, which supports the aforementioned aural options as well as several more — including the ability to play a sound when you choose the Finder's Empty Trash command. To move beep sounds into and out of the System file (and other files, such as HyperCard stacks), try Riccardo Ettore's shareware SoundMover.



○ Arrow
● Watch
○ I-Beam
○ Plus
○ Cross

☒ Animate; delay = 8
☐ In Color
☒ Cursor ClickChange ON

Figure 25-9: Mac Makeover It may not be tasteful, but it's personal. This Mac (top) is wearing a new window and scroll bar style, thanks to Dubl-Click Software's ClickChange (bottom). ResEdit was used to create the custom Trash icon, the appropriately renamed Empty Trash command, and the Command key shortcuts for the Flush, Restart, and Shut Down commands. The ClickChange screen shows several animated cursor options you may choose as replacements for the wristwatch's moving hands.

Custom ImageWriter paper sizes

A common request of ImageWriter owners is the ability to add custom page sizes to the ImageWriter Page Setup dialog box — perhaps for printing on index cards or special label stock. It's a breeze, thanks to a free utility called PREC Manager by Bill Steinberg. PREC Manager was created back in 1985, but it still works with today's ImageWriter driver.

Customizing the System 6 Finder

If you're still using System 6, one of the most useful modifications you can make involves customizing the Finder's LAYO (short for layout) resource, which controls several Finder characteristics — the amount of space it puts between icons, whether it warns you when you throw away a program, the font and format in which it displays dates and other information, and more. A free utility called Layout (by Michael C. O'Connor) makes it easy to modify the LAYO resource and tailor the Finder to your tastes.

Even if you aren't a customizing buff, chances are you can use Layout to make the Finder work better for you. Symantec's Norton Utilities for the Macintosh includes Layout Plus, a version of Layout with more customizing features.

Layout and Layout Plus don't work with System 7, nor are they needed for System 7. As I described in Chapter 24, System 7's Finder and its control panels give you many of the same customizing options.

The World of ResEdit

To Mac aficionados, customizing resources means using Apple's ResEdit utility, which has been around nearly as long as the Mac itself. ResEdit sports an elegant design that makes many resource editing jobs as easy as clicking and dragging — although you can still wreak havoc by editing resources indiscriminately.

ResEdit is available through user groups and on-line information services such as America Online. You can also buy it from the APDA, Apple's source for developer tools (800-282-2732 in the US). But the best way to get ResEdit is to buy *ResEdit Complete* (Addison-Wesley, 1991). Written by Peter Alley (one of ResEdit's designers) and Carolyn Strange; it's the best guide to understanding and tinkering with ResEdit and resources I've seen. It also includes a disk containing ResEdit 2.1 and a variety of fun resources you can add to your system, including animated mouse pointers and replacement icons for alert boxes and the Trash can. (The toilet icon pairs up well with a SoundMaster-modified Empty Trash command, if you get my drift.)

In addition to *ResEdit Complete* there's *Apple's ResEdit Reference* (Addison-Wesley, 1990), a somewhat dry overview of ResEdit's capabilities. A better book for the customizer is *Zen and the Art of Resource Editing* (Peachpit Press, 1992). This little volume, written by gurus from the legendary Berkeley Macintosh User's Groups (BMUG) contains concise overviews of various resource-editing concepts and projects and includes two disks containing ResEdit and a variety of replacement mouse pointer, icon, and keyboard resources. And if you graduate beyond ResEdit (not likely, unless you're a programmer), you'll want Mathemæsthetics' Resourcerer, a resource editor so powerful it makes ResEdit look lame.

A ResEdit primer

When you open a file with ResEdit, its resources appear in a type picker window. To access the resources of a given type, double-click that type's icon. Doing so displays a resource picker window that shows the resources of that type in the file you've opened. Some pickers display their contents graphically, while others use text. Double-clicking on a resource in a resource picker window opens that resource for editing.

Some of ResEdit's graphical editors provide fatbits displays for editing icons or fonts (see Figure 25-10 "Editing Icons"). You can customize the icons the Finder uses by editing ICN# resources, but for the Finder to recognize the new icons, you may need to rebuild your disk's Desktop file (restart the Mac while pressing ⌘-Option until you're asked if you want to rebuild the Desktop file, and then click OK). The painting tools, which are also used by ResEdit's font, mouse pointer, and pattern editors, operate like those of HyperCard and most painting programs.

A cookbook of ResEdit projects

ResEdit lets you perform all of the customizing jobs that ClickChange, Layout, and PREC Manager can perform, although those programs are easier to use and, more to the point, are less prone to accidental misuse. But there are customizing tasks that demand ResEdit's power. The following are some customizing examples and tips.

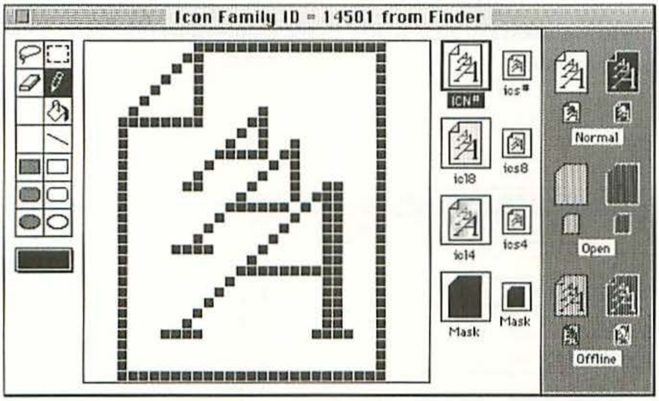


Figure 25-10: Editing Icons ResEdit's icon editor provides a fatbits display. The editor for the Finder's ICN# resources is shown here. Notice that an ICN# resource comprises the same basic icon in several styles: The Finder uses the variants to indicate that an item is selected or not selected, selected and open or not selected and open, and selected but off-line (its disk is ejected but still on the desktop) or not selected but off-line.

Adding or changing ⌘-key shortcuts

You can use a keyboard enhancement utility such as QuicKeys to change a program's keyboard shortcuts, but the shortcuts don't appear in the program's menus and they won't be copied if you move the program to a different disk. When you alter a program's MENU resources with ResEdit, your custom shortcuts are there for good, or until you change them again (see Figure 25-11 "Modifying Menus").

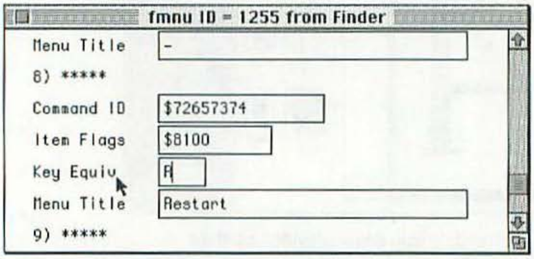
If you want to add keyboard shortcuts to System 7's Finder, you need ResEdit 2.1.1 or later. These versions support the System 7 Finder's special menu resources, which are called fmnu (short for Finder menu).

Rearranging a dialog or alert box

If you're fond of long document names, you may wish that a certain program's Open dialog box showed more of them. By editing a program's DITL resources, you can enlarge the list box to show longer names (see Figure 25-12 "Dialog Enhancements").

You may also want to add descriptive text to a dialog box to remind you of its purpose. If a certain program annoys you by beeping twice when asking if you want to "save changes before closing," edit the appropriate ALRT resource and use ResEdit's Set ALRT Stage Info command to banish the beeps. Using the same command, you can even change an alert box's default button (the one you can choose by pressing Return).

When editing a dialog box, be sure not to remove any items or change them into other items (for example, don't change a check box into a radio button). Also avoid deleting codes that begin with a caret (^) and end with a number, as in ^0 or ^1. These codes represent placeholders that the Mac replaces with other text. For example, in a dialog message that reads "Save changes to ^0?", the Mac replaces ^0 with a document name.



Menu Title -

8) *****

Command ID $72657374

Item Flags $8100

Key Equiv R

Menu Title Restart

9) *****

Figure 25-11: Modifying Menus With ResEdit, you can add ⌘-key shortcuts to menus. Here, a shortcut is being created for the Finder's Restart commands.

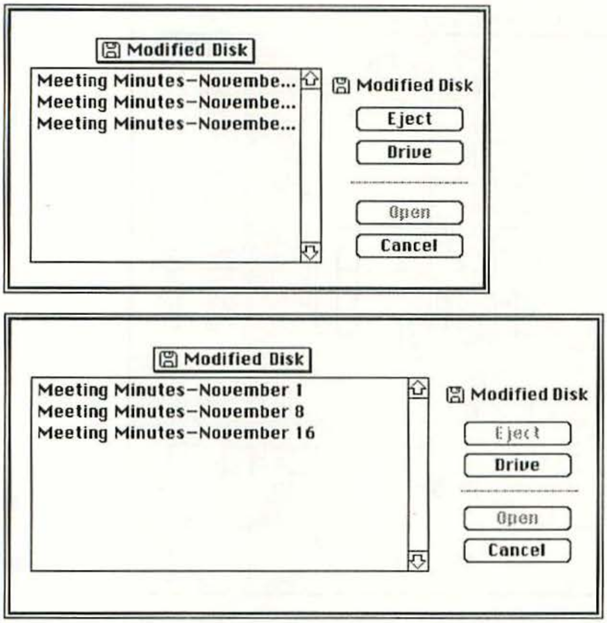

Modified Disk
Meeting Minutes–Novembe...
Meeting Minutes–Novembe...
Meeting Minutes–Novembe...
Modified Disk
Eject
Drive
Open
Cancel
Modified Disk
Meeting Minutes–November 1
Meeting Minutes–November 8
Meeting Minutes–November 16
Modified Disk
Eject
Drive
Open
Cancel

Figure 25-12: Dialog Enhancements Which is which? One pitfall of lengthy document names (top) is that you may be unable to tell one document from another in an Open dialog box. By using ResEdit to enlarge a program's Open dialog box (bottom), you can see those longer document names.

Creating and switching between keyboard layouts

By editing the System file's *keyboard layout* (KCHR) resource, you can rearrange the keyboard layout to suit your tastes. One useful tweak involves changing the Shift-period key sequence to generate a period (not the less-than symbol) and Shift-comma to generate a comma (not the greater-than symbol). With this modification, you can type abbreviations such as "P.O." and "D.C." without having to press and release the Shift key for each period. Other possibilities include moving the typographer's quotes or other often used Option-key characters to less finger-twisting key positions.

To modify the keyboard layout, start by opening the System file and duplicating an existing layout. (If you bought your Mac in the United States, your layout is named *U.S.*) Then alter the layout as desired, close it, and use ResEdit's Get Info command to rename it, giving it a moniker that reflects your modification (for example, *Easy Quotes*). Finally, save the System file.

The System file can accommodate multiple KCHR resources. When it does, the Keyboard control panel lists each one, as shown in Figure 25-13 "Multiple Keyboards." You can switch between layouts using the Keyboard control panel, but

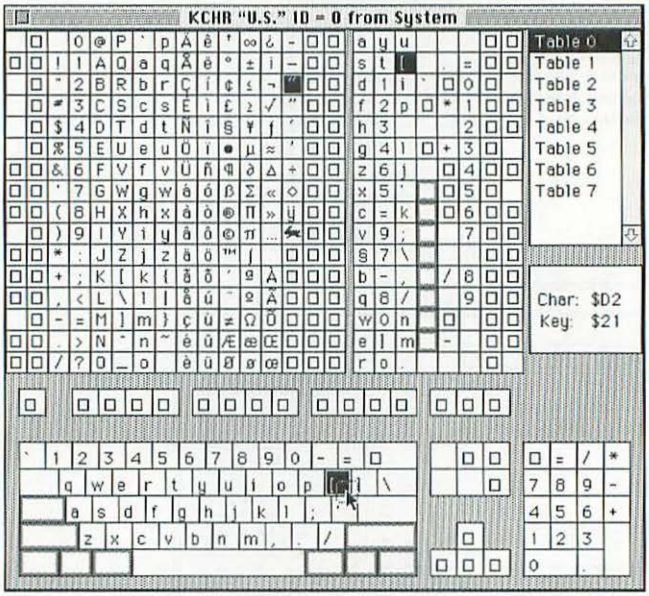
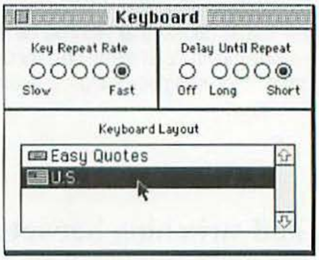


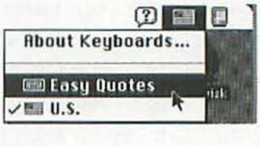
Figure 25-13: Multiple Keyboards
By editing and creating KCHR resources (top), you can customize the layout of the Mac's keyboard. You can move a character to a different key sequence by simply dragging it from the upper portion of the display to the desired key location. When your System file contains multiple keyboard layouts (middle), you can switch between them using the Keyboard control panel. If you modify the System file's itlc resource, you can activate System 7's keyboard menu (bottom), which lets you switch layouts without having to use the Keyboard control panel.



Key Repeat Rate ○○○○● Slow Fast

Delay Until Repeat ○ ○○○● Off Long Short

Keyboard Layout: U.S.



because you're a ResEdit pro by now, you can make switching even easier by activating System 7's Keyboard menu. Using ResEdit, open the System file and open the itlc resource. Locate the radio buttons labeled Always Show Kybd. Icon and check the 1 button. (The Mac consults this bit at start-up time: If the bit is set to 1, the Mac displays the keyboard menu.)

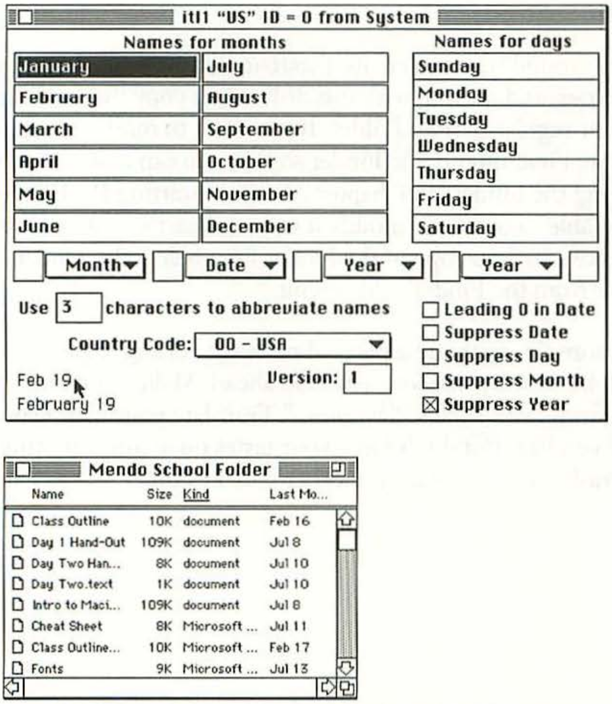
The Keyboard menu appears between the Application and Help menus (see Figure 25-13 "Multiple Keyboards"). After you activate the Keyboard menu, you can use it to switch between layouts — no need to use the Keyboard control panel. The Keyboard menu even provides a keyboard shortcut for switching layouts: Press ⌘-Option-spacebar.

Modifying date, time, and number formats

To determine how to display date, time, and numeric values, the Mac uses two System file resources — itl0 (for date values) and itl1 (for time and currency values). By altering the itl0 resource, you can change the date format that the Finder uses in its list views (see Figure 25-14 "Short Dates"). By altering the itl1 resource, you can change the format used for currency and numeric values — handy if you're preparing documents for colleagues in other countries.

Customizing Caveats

ResEdit gives you full access to the resources that the Mac and its programs use, but that doesn't mean you can perform the same modifications on every program. Many programs use resources in nonstandard ways. Microsoft Word, for example,



Names for months		Names for days
January	July	Sunday
February	August	Monday
March	September	Tuesday
April	October	Wednesday
May	November	Thursday
June	December	Friday
		Saturday

Use 3 characters to abbreviate names

Country Code: 00 - USA

Version: 1

☐ Leading 0 in Date
☐ Suppress Date
☐ Suppress Day
☐ Suppress Month
☒ Suppress Year

Feb 19
February 19

Name	Size	Kind	Last Mo...
Class Outline	10K	document	Feb 16
Day 1 Hand-Out	109K	document	Jul 8
Day Two Han...	8K	document	Jul 10
Day Two.text	1K	document	Jul 10
Intro to Maci...	109K	document	Jul 8
Cheat Sheet	8K	Microsoft ...	Jul 11
Class Outline...	10K	Microsoft ...	Feb 17
Fonts	9K	Microsoft ...	Jul 13

Figure 25-14: Short Dates By editing the System file's itl1 resource, you can customize the names and formats that the Mac uses to display date values. The pop-up menus and check boxes at the bottom of the itl1 editor (top) have been used to change the Mac's date format to display only the month and the date. A Finder window (bottom) uses the new format. To change the format used for time and currency displays, edit the System file's itl0 resource.

doesn't use MENU resources (fortunately, Word provides its own menu-customizing features). Similarly, Aldus PageMaker's resources aren't stored in the PageMaker application file, but in a System Folder file called PM4 RSRC (for PageMaker 5, PM5 RSRC). And MacDraw II stores MENU resources that list customized views, line, and font settings in its own documents.

That last example brings up an important point: Resources in a document override those in an application, and resources in an application override those in the System file. For example, the System file contains standard templates for the Open and Save dialog boxes, but many applications override them and provide their own. Thus, modifying the System file's Open and Save dialog boxes may not have any effect on your favorite program.

When you're modifying a Finder or System file, you need a way to replace the original Finder or System file on your start-up disk. You can't simply copy the modified version to your start-up disk's System Folder because the Mac can't replace a file that's currently in use — that would be like trying to change a car's tires while it's moving.

One way to work around this is to create a start-up floppy disk containing a pared-down System Folder, and start up with this disk. Then copy the modified Finder or System file to your regular System Folder. If you want to modify the Finder, here's another technique: First, modify the Finder so that you can quit it (see the Quick Tips box "Quitting the Finder" in Chapter 23). After starting ResEdit, quit the Finder: You'll be able to open and modify it to your heart's content. For safety's sake, though, make a backup copy of the Finder first: Select the Finder file and choose Duplicate from the Finder's File menu.

Finally, don't ignore the aesthetic aspects of resource editing, especially if your Mac or programs will be used by someone else. Go ahead: Make your Mac's interface look like a prop from "Pee Wee's Playhouse." Translate your menu commands into Pig Latin if you like. But don't force your tastes on an unsuspecting colleague. One person's Trash is not necessarily another person's toilet.

CHAPTER 25 CONCEPTS AND TERMS

- Utilities form the supporting cast of your Macintosh setup: They work together with the Mac's system software and with your application programs to improve the Mac's performance and enhance its operation.
- Utilities that work together with application programs may operate as extensions (INITs), desk accessories, function keys (FKEYs), Chooser devices (RDEVs), or control panels (cdevs).
- Navigation utilities such as CE Software's QuicKeys and Affinity's Tempo II Plus let you create keyboard shortcuts and automate repetitive tasks.
- File-searching utilities such as Claris Clear Choice's RetrieveIt! and Alki Seek give you more file-searching options than the Finder's Find command provides.
- Resource management utilities such as Suitcase II and MasterJuggler make it easier to work with fonts, FKEYs, sounds, and other system resources.
- Apple's AppleScript takes automation to its limits by enabling you to write scripts that perform tasks when run. An application program must be scriptable in order to be controlled by scripts, and recordable in order to automatically generate scripts as you use it.
- For hard-core customizing, you need a copy of Apple's ResEdit utility. ResEdit lets you tinker with (and damage, if you aren't careful) the resources that programs use as they run.

applet
A tiny application program, created with AppleScript, that you can run directly from the Finder.

attachable
An AppleScript term used to describe a program that enables you to assign, or attach, scripts to menu commands or to buttons or other on-screen elements. When you click or otherwise activate an element to which a script is attached, the script runs.

backup utility
A program that simplifies backing up a hard disk. Examples include Dantz Development's Retrospect or DiskFit series, Inline Design's Redux, or Fifth Generation Systems' Fastback series.

cdev
The technical name for a control panel, which is stored in the Control Panels folder within the System Folder.

disk optimizer
Also called a *defragmentation utility*, a utility that keeps a hard disk running at top efficiency by rearranging its contents so that all files are stored contiguously.

droplet
A tiny application program, created with AppleScript, that you can run directly from the Finder and that acts like a drop box: You can drag icons for files, folders, or disks to the icon of a droplet, and the droplet runs and then performs some kind of operation on those icons.

extension
A program that enhances the Mac's system software by adding features or enabling the Mac to access a device, such as a printer. Examples of extensions include INITs, control panels, and printer drivers.

file-recovery utility
A program that can resurrect files you accidentally delete and repair damaged disks or files. Examples include Symantec's Norton Utilities for the Macintosh, Fifth Generation's Public Utilities, and Central Point Software's MacTools Deluxe or Safe & Sound.

keyboard layout
A resource (with a type of KCHR) that associates the characters in the Mac's character set with keyboard positions. By editing the System file's keyboard layout, or KCHR, resource, you can rearrange the keyboard layout to suit your tastes. The System file can accommodate multiple KCHR resources; you can switch between them using the Keyboard control panel or the Keyboard menu.

macro utility
Also called a *keyboard enhancement utility*, a utility that lets you create keyboard shortcuts, streamline system settings, and automate repetitive tasks.

partitioning utility
A utility that lets you divide a hard disk into multiple partitions, each of which appears on the desktop as a separate disk icon.

RDEV
The technical name for a Chooser device — an icon that appears in the Chooser desk accessory.

(continued on the next page)

(continued from the previous page)

recordable
An AppleScript term used to describe a program that can work with a script editor utility to automatically create scripts as you work.

resource management utility
A utility, such as Fifth Generation Systems' Suitcase II or AlSoft's MasterJuggler (part of the Alsoft Power Utilities package), that simplifies working with fonts, FKEYs, sounds, and other system resources. Also called *font/DA extender.*

resources
Small, structured tidbits of information the Mac uses as it runs. Resources are grouped by function into resource types, which have four-character names such as MENU and LAYO.

script
A series of commands that controls one or more programs when played back.

scriptable
A term used to describe a program that supports AppleScript and therefore can be controlled by scripts.

text-retrieval utility
A program that can search for text contained within files. Examples include Alki Software's Alki Seek, Microlytics' Gofer, On Technology's On Location, Claris Clear Choice RetrieveIt!, and Virginia Systems' Sonar series.

CHAPTER TWENTY-SIX

Mass Storage

IN THIS CHAPTER

- Understanding how floppy disks and hard drives store data
- Working with floppies: 400K, 800K, and SuperDrive floppies compared
- Maximizing hard disk performance
- Shopping for a hard disk
- Removable media drives: combining hard disk performance with floppy disk security

The Mac is a remarkable machine, but how quickly it forgets. The moment the juice is turned off, the Mac becomes a dark and silent box, and your efforts leave its memory chips like air from a bursting balloon.

Because memory forgets, computers have always been paired with mass-storage devices — originally punched cards, and then paper or magnetic tape, and now the current standard, magnetic disks. Storage devices hold the documents you create and the applications you use. In this chapter, you'll tour the mass-storage world, with a focus on hard disks and other high-capacity media. I also provide some tips for organizing a hard disk to maximize its speed and efficiency.

A Magnetic Voyage

In the late seventies, personal computer users wept for joy as floppy disks replaced slow, unreliable cassette tapes as the standard storage device. Floppy disks transformed the microcomputer storage world by allowing *random access* to data. To appreciate that, locate a song in the middle of a phonograph album, and then try locating a song in the middle of a cassette tape. You have to access a cassette sequentially — by fast-forwarding and rewinding — but you can plop a turntable's tone arm in place at any point. Similarly, a computer can access any spot on a disk almost immediately by moving the drive's heads to that point.

Spinning disks

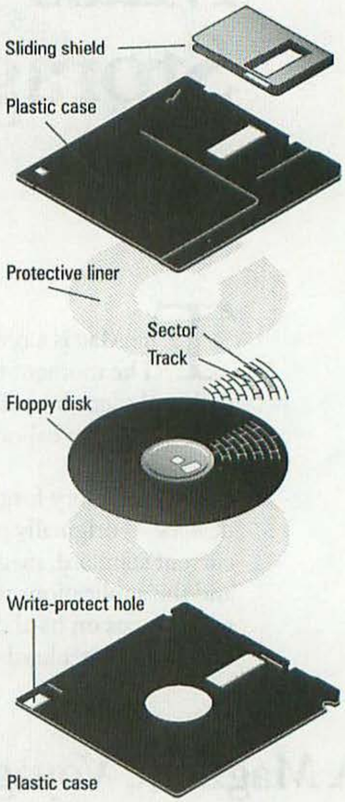
Inside a floppy disk's plastic case is a disk of flexible (floppy) plastic, coated with iron oxide particles (see Figure 26-1 "Inside a Floppy Disk"). This disk spins at 390 to 600 revolutions per minute as it is being accessed. When the Mac saves a document or copies a file, a read/write head in the disk drive generates a magnetic field that positions the disk's iron particles in patterns corresponding to the zeros and ones that comprise the information being written. When the Mac reads from the disk, the particles recreate the magnetic field in the head.

Making tracks and sectors

A disk is divided into 80 concentric circles called *tracks*, and each track is divided into wedges called *sectors*. The number of sectors in a track depends on the track's location; tracks located near the disk's outer edge have room for more sectors than the smaller tracks closer to the disk's center. The disk's rotation speed varies depending on which tracks the read/write head is accessing.

You can look at a phonograph album and see grooves, but you can't look at a disk and see tracks and sectors. A disk's divisions aren't physical ones; they're magnetic boundaries recorded on the disk when it's *initialized*, or *formatted*. This software approach to disk formatting enables many other computers to use the same 3½-inch disks that the Mac uses. Fresh out of the box, the disks are identical lumps of storage clay. Each computer's system software sculpts the disk to its own needs by initializing it.

INSIDE A DISK



Opening a disk's case reveals the floppy disk it protects. What you can't see is how the disk is divided into concentric rings, or tracks, containing sectors that store your data and programs.

Figure 26-1: Inside a Floppy Disk

Part of the sculpting process involves creating the tracks and sectors; the other part involves reserving parts of the disk to hold special information. Some tracks hold start-up software — the instructions that either transfer control to the Finder when

POWERBOOK ANGLE

Buying Preformatted Floppies

Many disk manufacturers and computer supply houses now sell preformatted floppies that you can use immediately — no initialization routine required. But isn't buying preformatted floppies a bit like buying presharpened pencils? Have we become so lazy that we can't even format our floppies anymore?

Actually, preformatted floppies are ideal for PowerBooks. If you need a fresh floppy on an airplane at 36,000 feet, you don't want to have to waste precious battery power initializing a disk. A preformatted floppy is ready to use immediately.

Of course, you can save money along with your battery by simply formatting a few floppies yourself before you unplug your PowerBook's AC adapter. While you're at it, sharpen a few pencils, too.

you start the Mac or eject the disk and display the blinking X icon to indicate that the disk can't start up the Mac. Other tracks hold information about the disk's contents, so the Mac can locate documents and applications and determine where a disk's available space is.

Floppy Capacities from 400K to SuperDrive

The original Mac floppy drive stored 400K. The Mac Plus premiered with 800K disk drives, which doubled storage capacity by using both sides of a floppy disk. 800K drives have two read/write heads, one for each side of the disk. If you have a 128K or 512K Mac or if you choose the Single Sided button in the disk-initialization dialog box, only one side of the disk is used. One reason you may choose the Single Sided option is to create a disk that a Mac with a 400K floppy drive can access.

Incidentally, it's worth mentioning that some of Apple's original 800K drives had an annoying habit of occasionally refusing to eject a disk completely. They sucked it back in, forcing you to pull out the Universal Disk Disgorger — an unbent paper clip — to rescue the disk, a job that always gets a chuckle out of onlooking IBM PC users. To use the Universal Disk Disgorger, insert it into the small hole next to the floppy drive and push. Don't pull on the disk — you risk damaging the drive mechanism.

QUICK TIPS

Dealing with Different Floppy Capacities

A high-density disk's differences can cause problems if you move disks between SuperDrives and 800K drives. If you use an 800K drive to initialize a high-density disk, the drive creates an 800K disk. That disk works properly in 800K drives, but when you insert it in a SuperDrive, you get a message asking if you want to initialize the disk. The message appears because the SuperDrive notices that extra hole in the case and tries to read the disk as a 1.4MB disk. What's more, once the disk has been initialized as an 800K disk, the chances of being able to successfully reformat it as a high-density disk are slim.

The tip? If you'll be swapping files between 800K drives and SuperDrives, don't use high-density floppies as your transfer medium. Instead, format an 800K disk and use it to transfer the files.

In 1989, Apple introduced the SuperDrive, also called the FDHD (floppy disk high-density) drive. SuperDrives, now standard equipment in all Macs and available as upgrades for older SEs and IIs, store 1.4MB on high-density disks, which have a thinner magnetic coating and smaller magnetic particles.

A high-density disk has a small hole in its upper-left corner, opposite the write-protect hole. A SuperDrive looks for this hole when you insert a disk. If the hole is present, you can initialize the disk to store its full 1.4MB. If the hole isn't present, the SuperDrive only enables you to create a 400K or 800K disk. And if you're curious, high-density disks spin at 300 rpm (revolutions per minute) regardless of which track the Mac is accessing.

Driving in the Fast Lane

These days, the hard disk has transformed floppies into a medium for backups and software distribution. An 80MB hard drive can hold the contents of more than 50 high-density floppies. A 20MB hard drive used to be the power user's choice; today, drives that store hundreds and even thousands of megabytes have become commonplace.

The quick and the capacious

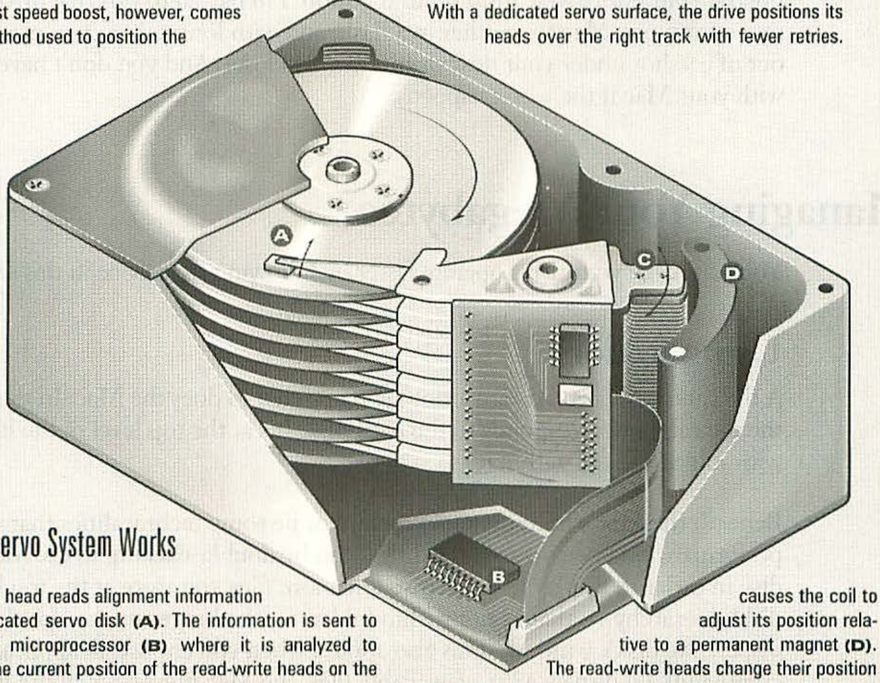
A hard disk may have the capacity of a truck, but it offers the performance of a Porsche. Hard disks transfer data many times faster than floppy disks, and that means less waiting when starting programs and saving files.

A hard disk owes its stellar speed and capacity to several factors. First, its magnetic surface isn't a sheet of flexible plastic, but a polished, precision-machined metal platter whose magnetic particles (and therefore, your data) are packed closer together. Most hard disks contain several platters, stacked like records in a jukebox and sealed in a dust-free enclosure (see Figure 26-2 "Inside a Hard Disk"). The platters spin at least 3600 rpm — six to nine times faster than a floppy disk. And hard disk platters generally spin continuously: A floppy stops when it isn't being accessed and takes about a half-second to get up to speed when the next access begins.

INSIDE A HARD DISK

High-capacity hard disk drives owe their speed to technology. These drives position the read-write heads with voice coil actuators, which are faster and more precise than the stepper motors used in smaller drives. Heads travel less on high-end disks, yielding faster access times, because data is packed more densely than on low-end disks.

The biggest speed boost, however, comes from the method used to position the heads over the data tracks. This method, called dedicated servo surface, uses one disk platter solely for aligning the heads over data tracks on other platters. In contrast, lower-capacity disks may use part of the data platters for positioning information (embedded servo method) or they may use no positioning information (open-loop method). With a dedicated servo surface, the drive positions its heads over the right track with fewer retries.



How the Servo System Works

A read-write head reads alignment information from a dedicated servo disk **(A)**. The information is sent to a dedicated microprocessor **(B)** where it is analyzed to determine the current position of the read-write heads on the drive's other platters. The processor instructs an amplifier to vary the voltage in the servo coil **(C)**. The strength of the magnetic field produced by the servo coil changes and causes the coil to adjust its position relative to a permanent magnet **(D)**. The read-write heads change their position in relation to the coil. With every change of position, the read-write heads send new signals to the servo disk, starting the loop over again.

Figure 26-2: Inside a Hard Disk

Keep your head up

Unlike the heads in a floppy drive, a hard disk's read-write heads don't touch the disk's surfaces, but ride a hair's width above them. If a hard disk's head does touch the surface, you've got trouble. That's a head crash, and it can occur when the drive is jostled during use, or even when a speck of dust gets between the platter's surface and the head.

A head crash used to damage the platter as the head dug a ditch in the platter's coating. Improved platter surfaces make today's drives more durable (although you still should never move or bump a drive that's in use). *Thin-film coating,* in which the platter is coated with a minutely thin film of metal, is one technology found in many of today's drives. Another safety feature is *automatic head-parking,* which retracts the drive's heads to a safe area when you shut down.

Inside versus outside

A hard disk can live inside or outside a Mac. Internal drives don't use any desk space, and they make moving your Mac more convenient. But if an internal drive breaks, your entire Mac must go to the shop. I'm partial to external drives. They move from one Mac to another in a flash, and with long cables, you can bury them out of earshot under your desk or in a nearby closet. And you don't have to part with your Mac if the worst happens.

Managing Your Megabytes

You can make your drive operate faster by following the advice in this section.

Using folders

A file cabinet lets you create a storage hierarchy; so does the Mac. In this hierarchy, the file cabinet corresponds to the hard disk: It's at the top level of the hierarchy, with folders nested within it.

Beneath the Mac's friendly folder metaphor lie some technicalities that influence performance. When you open a disk's icon by double-clicking it, the Mac scans the disk in order to display its contents. The more files you store at the top level of the disk's hierarchy — that is, not within folders — the longer it takes for the Finder to display the disk's window. This also applies when you choose an application's Open command: To display a list of available files, the Mac must scan all the files in the current level of the disk's hierarchy. The more files present there, the longer the scanning process takes.

The Mac all but ignores files stored in a folder until you actually open the folder. So, by grouping documents and applications into folders, you'll boost the Mac's performance by reducing the number of files it has to scan at once. And there's the convenience factor: Instead of having to electronically paw through dozens of word processor files, for example, you can go directly to the Proposals folder, the Memos folder, or the Seedy Novel folder, and quickly locate the file you need.

Creating and nesting folders

To create a folder, use the Finder's New Folder command (in the File menu). The Finder gives new folders the name *untitled folder*; you'll want to change that to something a bit more appropriate — Documents, Proposals, Graphics Programs, whatever best describes the folder's contents. At this point, you can open the new folder and follow the same process to create another folder inside it — just as you can nest one manila folder within another. This lets you develop a storage hierarchy that keeps your files orderly. You can nest folders more than a dozen levels deep, but navigating through more than five levels or so becomes cumbersome and time-consuming.

The number of folders you create and the names you give them is up to you. Some people create date-oriented folders — January Work, February Work, March Work, and so on — and then create folders within them for specific types of documents such as memos, publications, and artwork. Some people create 26 folders, one for each letter of the alphabet, and file documents within them. You'll find a sample filing scheme in Figure 26-3 "Organizing a Hard Disk." It's just a starting point, though: The best filing system is one you've personalized for your work style.

Using Find to find it

Even with an efficient filing system, you may occasionally misplace a file. When you do, use the Find command in the Finder's file menu. You can find powerful file- and text-searching features in a variety of third-party utilities, too (see Chapter 23).

Creating partitions

Another way to streamline storage involves using partitioning software, which electronically divides a drive into a number of smaller *logical volumes*. You can mount and unmount these volumes as though you were inserting and ejecting separate disks.

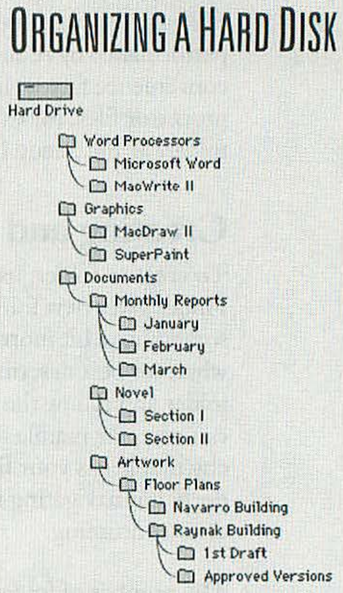
Keeping fragmentation in check

To keep a drive running at top performance, keep fragmentation in check. In its zeal to reuse space freed by deleted files, the Mac may scatter newly saved or copied files across physically discontiguous tracks. The longer you use a hard disk, the more likely it is that it contains fragmented files. When many files are fragmented, the drive's heads spend too much time in transit, and performance suffers.

Two solutions exist: Back up the entire disk, reformat it, and then recopy the files, starting with the System Folder and the applications you use most often; or run a defragmenting utility, which moves files around to make them contiguous (see Chapter 23). With the latter route, back up the drive first; the disk's contents can be damaged if something happens during defragmentation.

Backing up, by all means

Speaking of backing up, do it. Electrocution aside, the loss of data is the most painful experience a computer peripheral can cause. It's an agony you can avoid by backing up faithfully. I present some guidelines in the next chapter.



Extensive use of folders improves the Finder's performance and keeps better track of files. In this filing scheme, each application category (word processor, graphics, and so on) resides in its own folder. Another folder holds all documents, separated into related category folders. Not shown is the System Folder, which contains files the Macintosh needs to start up and run.

Figure 26-3: Organizing a Hard Disk

Driving to the High End

For color publishers, a hard drive can't be too fast. Prepress professionals lose money every time they drum their fingers waiting for Adobe Photoshop images to open or save. Fast, high-capacity hard drives are also essential for professional-quality audio and video work. And they're the mainstays of network *file servers* that supply application programs and documents to an office full of computers. A fast hard drive enables a server to keep up with the data demands of the users connected to it.

Spindle speeding

The latest drives meet these challenges. The availability of Seagate's Elite-2, Elite-3, and Barracuda mechanisms make the latest high-capacity drives faster than their predecessors. One reason these drives are faster is that their internal platters spin faster. A fast spindle speed allows for a faster data transfer rate, because more bits pass beneath the drive's heads each second. A fast spindle speed also lowers latency — the time it takes for a particular spot on the drive's platters to reach the drive's heads.

Not long ago, the fastest drives had spindle speeds of 4500 and 5400 rpm, compared to the 3600-rpm speed most other drives used. These days, spindles are speeding at 6300 and even 7200 rpm — a dizzying 120 revolutions per second.

Making your Mac keep up

But this extra spindle speed is wasted if the Mac can't keep up. The fastest hard drives can send and receive data faster than any Mac except a Quadra or high-end

POWERBOOK ANGLE

Tips for Driving Small

Thanks to their rear-panel SCSI connectors, all PowerBooks can tap into the same universe of external storage options as their desk-bound cousins. (To use an SCSI device with a PowerBook Duo model, you need to add an appropriate dock, such as Apple's Duo MiniDock.)

As for internal hard drives, a PowerBook's tight confines require a 2½-inch hard drive. At this writing, drives of up to 120MB are available in this petite size. Most hard drive firms sell internal drives for PowerBooks, and some offer trade-in allowances for your existing hard drive. Some firms also offer case kits that let you turn your existing internal drive into an external drive — a nice alternative.

Wake up and go to sleep

A hard disk is one of a PowerBook's major power consumers (the screen backlight is another). Given this, you may think it's best to put the hard drive to sleep whenever possible. The problem is, it takes four times the amount of power to wake up a sleeping hard disk than it does to keep it spinning. If you frequently alternate between putting the drive to sleep and waking it up, you are using more battery power than if you simply leave the hard disk spinning. You also waste time, because it takes a few seconds for the disk to spin up to operating speed.

X-ray vision

Should you put the PowerBook through an airport x-ray machine? I don't recommend it: The motors in older x-ray machine conveyor belts can generate magnetic fields strong enough to erase data from the PowerBook's hard disk. Many PowerBook owners do run their computers through x-ray machines without problems, but you may want to play it safe and ask that the computer be inspected by hand.

Centris. On a slower Mac, an ultra-fast drive twiddles its thumbs as it waits for the SCSI bus. In order for a slower Mac to keep up with an ultra-fast drive, you need a SCSI-2 adapter, which gives your Mac the latest in SCSI interfaces — and one that can better keep up with the hard drive. For details on SCSI-2 adapters and SCSI in general, see Chapter 27.

More Tech Talk

The speed at which the hard drive's disk spins and the density of the data in its tracks aren't the only factors that contribute to performance. Here's a look at some other technical specifications you can encounter when shopping for a drive.

Average access time

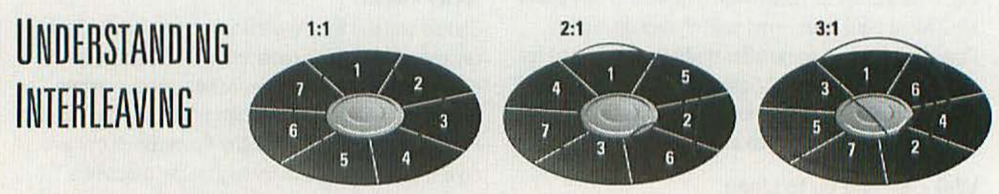
This tells you how long it takes for the drive's heads to locate a given spot on the disk — the mass-storage equivalent to moving a phonograph's tone arm to a given spot on an album. The average access time is measured in milliseconds; the lower the value, the better.

Data transfer rate

This is a measure of how quickly the drive can shuttle bytes to the Mac. The higher the value, the better, but only to a point. Mac Classics, SEs, and Pluses, for example, can't handle as high a transfer rate as a Mac II, Centris, or Quadra machine.

Interleave ratio

This describes the organization of sectors in each track (see Figure 26-4 "Understanding Interleaving"). Generally, the lower the interleave ratio, the better. A 1:1 ratio is best — if your Mac can scarf up sectors at that speed. Back when hard drives



On a disk with a 1:1 interleave, the sectors are numbered and accessed in sequence. With a 2:1 ratio, the heads read from, or write to, every other sector. With a 3:1 ratio, every third sector is accessed.

Figure 26-4: Understanding Interleaving

were slower, slower Macs such as the SE and Plus needed a 2:1 or even a 3:1 ratio. But the majority of today's drives provide built-in *data caching*. The drive reads an entire track and stores it in a small reserve of memory. When the Mac requests subsequent sectors from that track, the drive sends the data from the cache. Thanks to this caching technique, you can safely use a 1:1 interleave ratio with any Mac.

How important are these specifications?

Performance specifications make for fun party talk, but they really aren't that important for most applications. In day-to-day use, the differences between most drives with similar capacities are minor.

Strength in Numbers — Disk Arrays

Disk arrays operate on the premise that anything one drive can do, multiple drives can do better. More specifically, a disk array ties multiple drive assemblies together in a way that enables them to deliver better performance and, in some cases, better reliability, than a single drive. The array's controller hardware and software tricks the Mac into thinking it's talking to a single drive.

Redundant and inexpensive

Disk arrays are structured and described according to a framework called *RAID* — redundant array of inexpensive disks — spelled out by researchers at the University of California at Berkeley in 1987. The RAID framework has six levels, numbered 0 through 5 (see Table 26-1). Each RAID level provides a different degree of performance improvement and/or reliability over a *SLED* — a single large expensive disk.

Data striping

A Level 0 array uses a technique called data striping to split data evenly across two drives, boosting data-transfer rates by enabling disk reads and writes to occur simultaneously. The drawback is that the array is only half as reliable as a single mechanism: If one mechanism fails, you lose the contents of both. Despite the acronym's first letter, there's no redundancy in Level 0 RAID.

Mirroring

The superior reliability aspects of RAID involve combining two or more drives in a way that ensures that no data is lost, even if one drive breaks. RAID level 1, *mirroring*, involves simply writing the same data to two drives. Several hard drive manufacturers include software with their drives that allows for mirroring.

Table 26-1
Levels of RAID

Level	*Title*	*Description*	*Pros*	*Cons*
0	Data Striping without Parity	Data is striped (split) evenly across two drives	Fast performance	Reduced reliability
1	Mirroring	Data is sent to two drives	Increased reliability	Performance suffers; cost per megabyte doubles
3	Parallel Disk Array	Data is transferred in parallel to an array of drives; one drive handles error correction	Reads from the array are fast; data can be restored when a drive fails	Writes can be slow; requires costly controller hardware
5	Independent Disk Array	Reads and writes data and error-checking information across all drives	The fastest and most reliable storage	Costly

Hot pluggability

RAID levels 3 and 5 provide superior reliability through more complex data recording methods. These RAID levels even allow for *hot pluggability* — a sloppy buzzword that means you can replace a defective drive within the array without having to shut down the system. RAID levels 2 and 4 aren't used on the Mac.

As for more ambitious RAID systems, they're highly specialized and very expensive. And they still can't guarantee that your Mac won't crash or break down or that the power won't go out. It's good that such exotic products are available for the small segment of the market that can use and afford them, but the rest of us will have to ride SLEDs — and hope they don't crash.

Megabytes to Go: Removable Drives

All hard drives have one similarity — sooner or later, they become full. It happens sooner if you're into megabyte-munching applications such as image scanning or digital audio recording. Or it may happen later, as you acquire more and more software and use it to create more and more documents. Whenever it happens, you'll face the ugly chore of archiving — copying dusty old folders and files to floppy disks to free up space on your hard drive.

Portability and security

Even if you don't worry about a hard drive's finite capacity, some of its other limitations may concern you. Unless they're installed in a PowerBook, internal hard drives aren't very portable — which makes it harder to move a large number of files to a different Mac. And if you're storing confidential information, you have to resort to security programs, which scramble and unscramble files based on passwords you type. Programs such as Kent-Marsh's FolderBolt do work (and are covered in the next chapter), but they add extra hassles to your work routine — especially if you forget a password.

Although external hard drives are more mobile and can be locked in a safe, you need to wrestle with SCSI cables before you can move them around. What's more, external drives are still delicate instruments that aren't designed for frequent travel. And most can make a big bulge in a briefcase.

Mobility and utility

The ideal storage device would combine the mobility and security of a floppy disk with the speed and space of a hard drive. The good news is that many such devices exist, each with its own merits. Some store as much data as can fit on a half-dozen high-capacity hard drives. But because they're slow, they're useful primarily for backing up hard drives and for secondary storage — holding files you want to have handy but don't need lightning-fast access to.

Others don't store quite as much, but are as fast as many hard drives, making them ideal for backing up or replacing a hard drive. Still other devices can hold the contents of a small library — but those contents can't be erased (see Table 26-2 for the salient points of each technology).

Media on the Move

The one trait all hard drive alternatives share is that their media — the stuff that holds your data — are removable, like a floppy disk. When you fill one cartridge, eject it and pop in another. Or use cartridges dedicated for certain tasks — word processing, publishing, QuickTime work.

The most popular removable-media drive in the Mac world is built around a mechanism manufactured by SyQuest and sold by all major hard drive vendors. SyQuest drives are particularly popular among publishers and QuickTime producers, who work with huge files and often need to transport them elsewhere.

Table 26-2
Storage Options at a Glance

Technology	*Primary*	*Secondary*	*Backup*	*Pros*	*Cons*
Conventional hard drive	Excellent	Excellent	Very Good	Fast; inexpensive	Files must be archived and then deleted when the drive fills
SyQuest removable	Very Good	Excellent	Excellent	Large installed base; inexpensive	Mixed reliability track record
Bernoulli removable	Very Good	Excellent	Excellent	Reliable	Costly, noisy; portable and transportable drives are heavy
Floptical drives	Poor	Good	Excellent	Inexpensive media; drives can access conventional floppies	Too slow for primary storage
Eraseable optical drives	Poor-Fair	Very Good	Excellent	Large capacity; low cost per megabyte	Costly; too slow for primary storage
WORM drives	Poor	Very Good	Poor	Large capacity; stored data is immune to magnetic fields and erasure	Costly; slow
Tape drives	Poor	Poor	Excellent	Inexpensive; many drives to choose from	Not usable for primary or secondary storage

The SyQuest mechanism works much like a conventional hard drive, except it uses a single metal platter instead of several, and the platter itself lives in a portable plastic cartridge that you can eject. What about dust, a hard drive's biggest enemy? When you insert a cartridge, the drive spins the platter at high speed for a few seconds in a routine designed to blow foreign intruders away.

The original SyQuest mechanism used 5 ¼-inch cartridges that held roughly 44MB — the equivalent of over 30 high-density floppy disks. A few years ago, SyQuest unveiled a new mechanism that stores 88MB on similar cartridges. The new drives can read from, but not write to, 44MB cartridges. The 44MB mechanism is still manufactured, and many firms offer both.

Some firms also sell versatile dual-drive models. With such a box, you can use both drives for primary storage, or use one to back up the other. A newer generation of SyQuest drive stores 105MB on 3 ½-inch cartridges that are about the same size as a floppy disk. Also available are internal drives designed to be installed in Quadra, Centris, and Performa models that have removable drive bays.

The Bernoulli Effect

The SyQuest drive's biggest competitor comes from Iomega, whose Bernoulli drives have been around in one form or another for over ten years. Early Mac models stored 20MB on bulky cartridges, but the latest store up to 150MB on cartridges that are slightly smaller than their 5 ¼-inch SyQuest equivalents. Earlier generations of Bernoulli drives stored 44MB or 90MB. The 150MB drives can read from and write to 90MB cartridges and can read (but not write to) 44MB cartridges.

Floating on a cushion of air

A Bernoulli drive takes advantage of fluid dynamics principles discovered by 18th-century mathematician and physicist Daniel Bernoulli (pronounced burr-NEW-lee). His Bernoulli Theorem states that the pressure of fluid or air decreases when it's moving. In aircraft, the decreased air pressure around moving wings gives them their lift. In bathrooms, the decreased air pressure caused by the showerhead's stream pulls the shower curtain in.

In a Bernoulli cartridge, a rush of air causes a flexible disk to be drawn to within a few thousandths of an inch of a rigid metal plate located in the drive (see Figure 26-5 "Inside a Bernoulli Drive"). The disk floats firmly within this air flow, flexing no more than one-thousandths of an inch.

Safe, flexible, and reliable

Because the disk is flexible, a foreign intruder isn't as threatening as it is to a hard disk. When something comes between a Bernoulli disk and its head, the disk flexes and the air flow blows the intruder away. The result is a temporary disk error that the Mac can detect and often correct.

INSIDE A BERNOULLI DRIVE

Bernoulli cartridges closely resemble standard floppy disks. Bernoulli technology uses dual, single-sided platters. The drive heads, which move laterally, read from above and below. The Bernoulli does not filter dust particles, but circulates air to move dust away from the media. Unlike SyQuest and Ricoh removable-media drives, the read-write heads do not actually contact the media, so head crashes cannot be caused by dust particles, and disk crashes also are rare. As seen in the detail, the platter flexes toward the head. An air cushion between the two floppy platters allow them to flex inward should a dust particle approach the head. The cartridge also locks in place while in use. This is necessary because unlike other removable-media, the Bernoulli cartridge protrudes from the drive during operation.

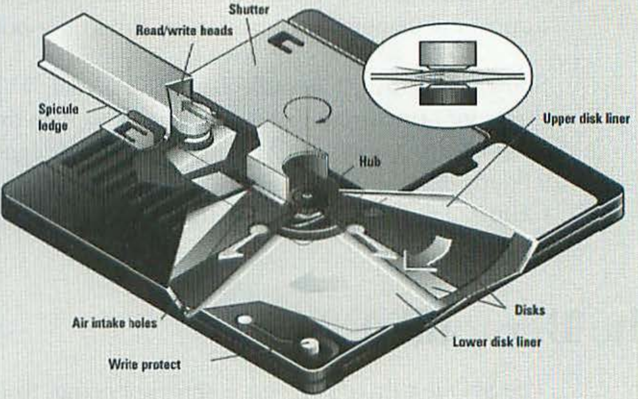
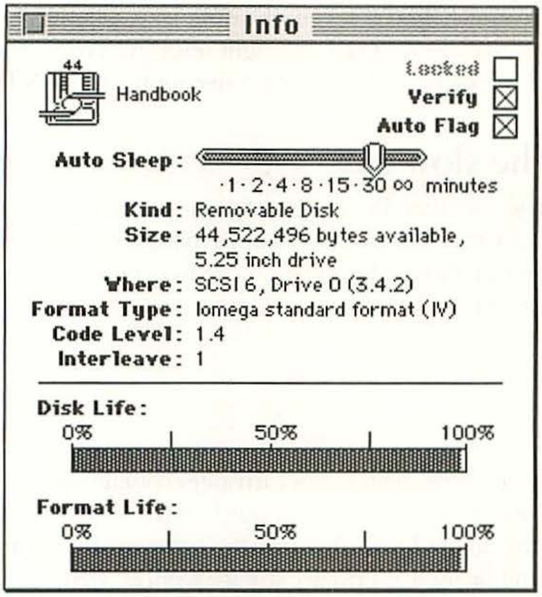


Figure 26-5: Inside a Bernoulli Drive

Inside a Bernoulli cartridge, a pair of flexible disks is drawn toward the drive's read/write heads by the air pressure generated by the spinning disks. The same air flow that attracts the media to the heads blows dust away from the media. If a foreign invader withstands the wind and wedges itself between the media and the heads, the disks flex to allow it to pass. It's a slick technology that has proven to be very reliable.

Loud for the life of the cartridge

On the down side, the media inside the cartridges does wear out over time, although Iomega warrants cartridges for five years: Most firms selling SyQuest cartridges offer only one- or two-year warranties. Bernoulli drives include a utility that tells you how much cartridge life is left (see Figure 26-6 "How Much Time Do I Have?"). Bernoulli drives are also noisier than SyQuest drives. The heads in older 44MB models required periodic cleaning, but the 90MB and 150MB drives are self-cleaning.


Info

44 Handbook

Locked ☐
Verify ☒
Auto Flag ☒

Auto Sleep: ·1·2·4·8·15·30 ∞ minutes
Kind: Removable Disk
Size: 44,522,496 bytes available, 5.25 inch drive
Where: SCSI 6, Drive 0 (3.4.2)
Format Type: Iomega standard format (IV)
Code Level: 1.4
Interleave: 1

Disk Life: 0% 50% 100%

Format Life: 0% 50% 100%

Figure 26-6: How Much Time Do I Have? Iomega's Workshop utility lets you monitor the health of a Bernoulli cartridge. The "sleep" option also lets you specify that a cartridge's disks spin down after a period of inactivity. Designed to conserve battery life on portable Bernoulli drives, this feature also prolongs the cartridge's life — and silences the noisiest part of a Bernoulli drive.

Super Floppies

Another removable-media device is the *floptical disk* — a kind of super floppy that stores roughly 20MB on 3½-inch cartridges that are similar to floppy disks.

How can a cousin to the floppy store 20 megabytes? The secret lies in the method the drive uses to position its heads. In a conventional floppy drive, the drive's electronics instruct a stepper motor to move the heads to a given track, but the electronics can't tell if the heads have really reached that exact place. Thus, the tracks on the disk must be wide enough to provide a margin of error.

Optical head positioning

A floptical drive relies on an optical pattern in the disk's surface for far more accurate head positioning. Technically, it's called *closed-loop, optical-servo* head positioning. Simply put, the optical patterns enable the drive to know exactly where its heads are and adjust their positioning so that they hit each track dead-on.

Just as the stripes on a freeway help you stay in the right lane, a floptical disk's optical patterns help the drive's heads reach the right track. As a result, a floptical disk can pack up to 1245 tracks per inch, versus a conventional floppy's 135.

It's cheaper in the slow lane

Floptical disks are much slower than Bernoulli or SyQuest cartridges, but they have their advantages. The disk cartridges cost less than Bernoulli or SyQuest cartridges, and the drives themselves can also read from and write to conventional floppy disks. The drives are also compact.

Tape Drives

Finally, there's the lowly *tape drive*, which uses cartridges containing magnetic tape to store between 60MB and 600MB (numerous tape formats are available). Tape drives are ideal for backing up hard disks, but because tapes are a sequential-access storage medium, they can't be used as primary storage devices. Bernoulli and SyQuest drives are far more versatile.

Now Available on Compact Disc

Compact discs, those silver platters that have made so many stereos obsolete, have invaded the mass storage world. And I am talking *mass* storage: A 5 ¼-inch compact disc holds as much as 650MB of data.

CD-ROM technology

As you saw in previous chapters, a compact disc that stores data is called a CD-ROM. A CD-ROM's data, like that of a ROM chip, is factory-frozen, unable to be erased. For this reason, CD-ROMs are used primarily as a distribution medium for software or data. Many businesses buy commercial CD-ROMs and use AppleShare or System 7's file-sharing features to make the discs' contents available to everyone on a network. Clip art, stock photographs, fonts, encyclopedias, dictionaries, and other research- and education-oriented CD-ROMs are available.

Multimedia and CD-ROM

As you saw in Chapter 21, CD-ROMs also play a part in the multimedia world, where their capability to hold digital audio as well as data makes them ideal for interactive instruction. In addition to providing a SCSI connector for attaching to the Mac, CD-ROM drives provide standard RCA-type audio output jacks that you can connect to a stereo.

QUICK TIPS

Life with a Cartridge

Using Bernoulli or SyQuest cartridge drives is a lot like working with hard or floppy disks, but there are a few differences to keep in mind, especially with SyQuest-based drives.

Ejecting SyQuest cartridges

Ejecting a SyQuest cartridge is a multistep process: Drag the cartridge's icon to the Trash, press a stop button on the drive, and then flip an eject lever on the drive. In a related vein, some SyQuest drives won't recognize a cartridge inserted after you've started up the Mac. Better SyQuest vendors include system extension software that enables the Mac to recognize cartridges inserted after startup. You can use control panels such as Robert Polic's shareware SCSI Probe to mount cartridges inserted after startup. This software is included with Bernoulli drives.

Cartridges and virtual memory don't mix

If you use System 7 with a 68030- or 68040-based Mac (or with a 68020-and-PMMU-equipped Mac), you should know that System 7's virtual memory feature isn't available when your startup drive is a removable cartridge. Virtual memory requires the use of a special file containing the data that System 7 swaps between real memory and the drive. If you were to eject a cartridge containing the swap file, you'd perform the equivalent of removing a car's tires while it was moving, and the results wouldn't be pretty.

As someone who used to use Bernoulli drives for primary storage, I found this particularly frustrating. Then I discovered FWB's Hard Disk Toolkit software, which allows you to enable virtual memory for ejectable cartridges. The software includes a terrific array of features for formatting and fine-tuning drives of all kinds. It includes software that enables the Mac to recognize SyQuest cartridges inserted after startup, as well as formatting software that can overcome the incompatibilities that arise between SyQuest drives from different vendors.

Conquering SyQuest compatibility problems

Although all vendors use the same basic SyQuest mechanism, you can't always move cartridges from one brand of drive to another. Each vendor is responsible for supplying the low-level SCSI driver software that enables the Mac to access the cartridge, and one company's software may not be compatible with another's. If you're buying a SyQuest-based drive to exchange files with someone who already has one, make sure that the two will be able to read each others' cartridges. Similarly, if you're acquiring multiple drives, consider buying from one source.

Another way to avoid SyQuest compatibility woes is to initialize your cartridges using a universal formatter utility such as FWB's Hard Disk Toolkit, Casa Blanca's Drive7, or La Cie's SilverLining.

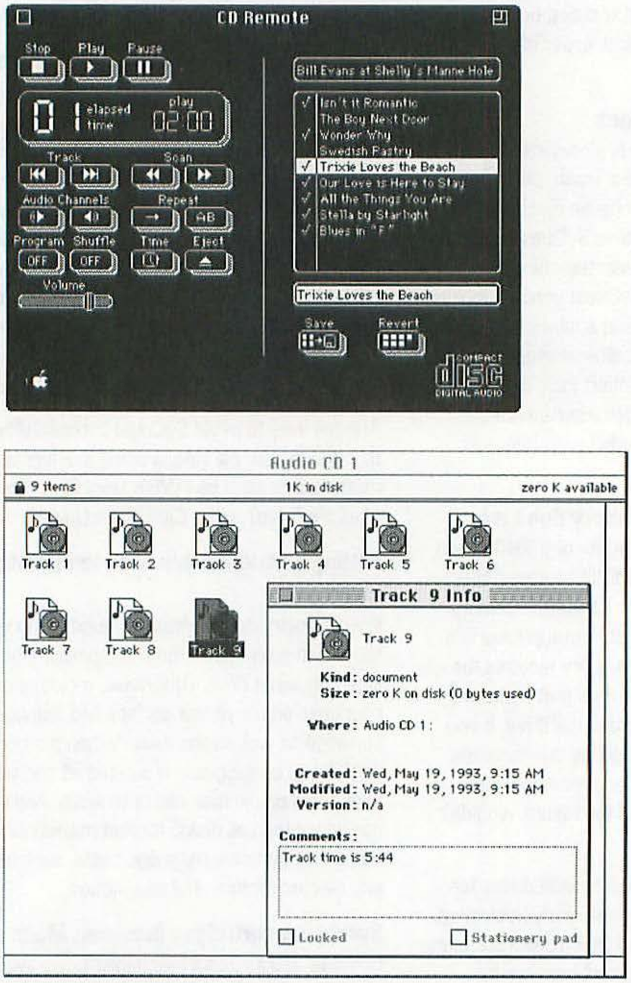
Letting cartridges adjust to temperature changes

If you're carrying a cartridge around in the winter, allow it to warm up to room temperature before inserting it in a drive. Otherwise, moisture could condense on the platter surface and damage the cartridge as well as the drive. When summer arrives, don't leave cartridges in a sun-baked car, where the heat could cause their cases to warp. And keep cartridges (and all disks, for that matter) away from items that generate magnetic fields, such as speakers, electric motors, and telephones.

Swapping cartridges between Macs and PCs

Bernoulli and SyQuest mechanisms are available for Macs and PCs. Some drives include software that lets you create MS-DOS and Mac partitions on the same cartridge. Utilities such as Dayna's DOS Mounter Plus also let you work with DOS-format Bernoulli and SyQuest cartridges as though they were Mac disks (see Chapter 28).

CD-ROM drives from Apple and many others include a desk accessory that lets you play audio CDs and an extension that lets audio-only CDs appear on the Mac's desktop (see Figure 26-7 "Now Taking Requests"). The Voyager Company's CD Audio Toolkit also provides HyperCard XCMDs and XFCNs that let you access an audio CD from within HyperCard stacks.



Bill Evans at Shelly's Manne Hole

- ✓ Isn't it Romantic
- The Boy Next Door
- ✓ Wonder Why
- Swedish Pastry
- ✓ Trixie Loves the Beach
- ✓ Our Love is Here to Stay
- ✓ All the Things You Are
- ✓ Stella by Starlight
- ✓ Blues in "F"

Trixie Loves the Beach

Kind: document
Size: zero K on disk (0 bytes used)

Where: Audio CD 1 :

Created: Wed, May 19, 1993, 9:15 AM
Modified: Wed, May 19, 1993, 9:15 AM
Version: n/a

Comments:
Track time is 5:44

☐ Locked ☐ Stationery pad

Figure 26-7: Now Taking Requests Apple's CD-Remote desk accessory (top) lets you play audio CDs inserted in a CD-ROM drive. You can also store and recall the names of the tracks on the CD and selectively enable or disable playback. With Apple's Foreign File Access extension, you can view an audio CD's contents on the desktop (bottom). Note the Get Info window showing a track's playback time.

CDs are not speedy

One problem with CD-ROMs is their slow speed. A typical hard disk has an access time of 10 – 30 milliseconds (ms), but most CD-ROM drives have 300–650-ms access times. (Apple's CD-300-series drives have a 295-ms access time.) The sluggishness is due largely to the fact that a CD-ROM's laser head is heavier and takes more time to move than a hard disk's magnetic read/write heads.

The latest CD-ROM drives (including Apple's) have a double-speed operating mode that spins the CD-ROM at 460 to 1060 rpm, versus the 230 to 530 rpm of standard-speed drives. One potential problem, however, is that some programs can't handle the double-speed operating mode. Apple's solution is the AppleCD Speed Switch, a control panel that lets you choose the speed at which the CD-ROM spins. Many third-party double-speed drives include similar control panels.

Recordable CD-ROM drives are now available. With such a drive, you can make your own CD-ROMs — for archival purposes, for small-scale distribution, or to send to a mastering house for mass duplication.

PowerBook Angle

PowerCD: A CD-ROM Drive To Go

Several CD-ROM drive manufacturers offer compact units that fit in a briefcase. For real portability, though, consider Apple's PowerCD, a 3-pound CD-ROM drive that runs on batteries (an AC adaptor is also included).

The PowerCD also provides excellent hardware and software support for audio CDs and PhotoCDs. With the included remote control, you can program the playback order of audio tracks or PhotoCD images. But unlike most CD players, the PowerCD lets you store your song or photo playback order — the next time you insert that CD, the PowerCD automatically recalls its program. The PowerCD's 8K of memory can hold programs for roughly 20 to 50 discs, depending on the number of tracks each contains.

The PowerCD is equally adept at handling PhotoCDs. It connects directly to the Video In connector on a television or video recorder. With the remote control, you can zoom in on images, rotate them 90 degrees, program a playback sequence, or edit a program you've already stored.

The PowerCD's audio and PhotoCD features are so impressive that it's easy to overlook the fact that this is a CD-ROM drive. Alas, it's a slow one. Because its Philips-built mechanism is designed to conserve battery power, the PowerCD transfers data at the sluggish pace of about 150K per second — about half the speed of today's double-speed drives.

If you're a serious CD-ROM user, don't buy a PowerCD as your sole drive — it's too slow. The PowerCD is best for the person who's looking for a portable drive for occasional CD-ROM use, but mostly wants full-featured audio and PhotoCD features for the living room.

Optical Storage Meets Magnetic Storage

Relatively slow performance is just one reason that optical-based storage isn't likely to replace magnetic storage any time soon. A more serious hurdle involves developing disks that can be erased and reused: Data is written on a CD-ROM by a laser that burns pits into the disk's surface.

WORMing your way into data

One alternative is offered by *write once, read many times* (WORM) drives. A WORM drive is the storage world's equivalent to indelible ink — once something is written to it, it can't be erased. Storing 400–900MB on a cartridge, WORM drives are specialized beasts most often used for storing data that must not be altered, such as legal and medical records.

Just say MO

But the storage technology that best clears the read/write hurdle uses — you guessed it — magnets embedded in the disk's surface. I'm referring to *magneto-optical* (MO) drives such as those offered by Microtech, Mass Micro, Peripheral Land, and others. Also called *erasable optical* (EO) drives, these devices use mechanisms that store 500 – 600MB on 5¼-inch removable cartridges. A newer generation of 3½-inch MO drives offers faster access times on cartridges that hold 100MB to 125MB.

To write to a cartridge, an MO drive uses a high-powered laser and electromagnet to orient the media's magnetic particles. To read from the cartridge, the drive uses a low-powered laser. Many of today's MO drives can also work as WORM drives. As with CD-ROM drives, however, access time is relatively slow, making MO drives better for long-term storage and retrieval than as substitutes for a conventional hard disk. They're also costly compared to conventional hard drives.

So the lowly magnet continues to serve us well and it looks like it will even have a place in tomorrow's disk drives. In the next chapter, I show you how to take care of your magnets.

CHAPTER 26 CONCEPTS AND TERMS

- Floppy and hard disks allow fast, random access to data.
- A floppy disk spins at 390 to 600 revolutions per minute and is accessed by a read/write head in the disk drive. When you initialize a disk, the disk's surface is magnetically divided into 80 concentric circles called tracks, each of which is divided into wedges called sectors.
- The capacity of Mac floppies has steadily increased. The original Mac floppy stored 400K; double-sided floppies doubled that to 800K, while today's high-density floppies store 1.4MB.
- Unlike a floppy disk, a hard disk contains several metal platters, which are stacked like records in a jukebox. Hard disks are faster than floppies in part because their disks spin faster and their magnetic particles are packed closer together.
- Removable-media drives such as SyQuest and Bernoulli drives combine the speed and capacity of a hard drive with the security and convenience of floppies.
- Today's fastest hard drives can transfer data faster than most Macs can accept it. To get the best performance out of a fast drive, you may need to add a SCSI-2 adapter to your Mac.

automatic head-parking
A safety feature that retracts a hard drive's heads to a safe area when you shut down.

average access time
The amount of time required for the drive's heads to locate a given spot on a disk.

data caching
A performance-boosting technique in which a drive reads an entire track of data and stores it in a small reserve of memory. When the Mac requests subsequent sectors from that track, the drive sends the data from the cache.

data transfer rate
The speed with which a drive can shuttle bytes to the Mac.

floptical disk
A kind of super floppy that stores roughly 20MB on 3½-inch cartridges that are similar to floppy disks.

fragmentation
A problem in which a hard drive scatters newly saved or copied files across physically discontiguous tracks. The longer you use a disk, the more likely it is that it contains fragmented files. When many files are fragmented, the drive's heads spend too much time in transit, and performance suffers.

head crash
An undesirable event in which a hard drive's read/write head slams into the platter. A head crash can occur when the drive is jostled during use, or even when a speck of dust gets between the platter's surface and the head.

high-density
Floppy disks that have a thinner magnetic coating and smaller magnetic particles than 800K disks. A high-density disk has a small hole in its upper-left corner, opposite the write-protect hole.

initialize
To prepare a disk or other storage medium for use. During initialization, the Mac creates the sectors on the disk as well as special reserved areas that enable the Mac to keep track of files.

interleave ratio
The organization of sectors in each track on a disk.

latency
The time it takes for a particular spot on the drive's platters to reach the drive's heads.

magneto-optical (MO)
A storage technology that combines magnetic and optical storage to offer the high-capacity of the latter with the erase-and-reuse flexibility of the former.

partitioning
Electronically dividing a drive into a number of smaller *logical volumes.* You can mount and unmount these volumes as though you were inserting and ejecting separate disks.

random access
The ability to quickly jump to any location on a storage medium such as a disk.

SCSI-2 adapter
A plug-in board that gives a Mac a SCSI interface that adheres to the SCSI-2 standard and, therefore, can transfer data more quickly than the Mac's built-in SCSI port.

sector
A wedge-shaped division on a hard or floppy disk.

spindle speed
The number of times per minute that a hard drive's platters revolve.

SuperDrive
The latest Mac floppy disk drives, capable of storing 1.4MB and reading floppies formatted for DOS PCs.

tape drive
A mass-storage device that uses cartridges containing magnetic tape to store between 60MB and 600MB. Tape drives are popular for backing up hard drives.

track
One of many concentric storage paths on a disk.

write once, read many times (WORM)
Abbreviated WORM, a type of optical drive whose media can be written to only once and can't be erased.

CHAPTER TWENTY-SEVEN

Disk Tips, Viruses, and SCSI

IN THIS CHAPTER

- Developing a backup strategy that protects your work
- Comparing backup programs and devices
- Using file-recovery programs — safety nets for your data
- Safeguarding your Mac against the computer virus threat
- Mastering the SCSI bus — how it works, and when it doesn't

A floppy or hard disk is a friend you can't quite trust. Most of the time, disks are faithful computing caddies that hold your software and documents; it's easy to become smug about this give-and-take relationship. Then one of them develops a case of amnesia, and all of a sudden it's: "Files? What files? I don't have any files." Just like that, you're forced to retype your documents from printouts (if you're lucky enough to have some), or worse, re-create them from scratch. Either way, it's *deja vu* in its ugliest form.

Disks can betray your trust in a variety of ways. Their microscopic magnetic particles can be led astray by magnetic fields produced by loudspeakers, telephones, electric motors, and the Mac's own power supply. They're susceptible to system errors, computer viruses, SCSI cabling problems, and program bugs, all of which can cause inaccurate information to be written to the disk. They face physical threats from spilled soda to dust to extremes of heat and cold. And hard disks can fall victim to head crashes, in which the read-write heads strike and damage the media surface.

Preparing for a Rainy Day

ON THE CD

- Dantz Development Retrospect demo
- Symantec Anti-Virus for Macintosh demo
- File-recovery and virus-detection utilities in The Best of BMUG collection

How do you maintain a relationship with such fair-weather friends? Use an umbrella — a *backup utility,* which stores copies of your files on floppy disks or other storage devices. Backups are to computers what vice presidents are to governments: They don't do much when the sailing is smooth, but when the worst happens, they're indispensable.

Every software library also needs a *file-recovery utility.* One of these rescue squads can save the day if disk problems occur or if you accidentally throw away a file in between backups.

In this chapter, I take a close look at backup and file-recovery utilities, and show how to use both to make your disks more trustworthy companions. I examine the computer virus threat and show how to protect your Mac. I also explore the ins and outs of the SCSI bus — and show what to do when the bus breaks down.

Backup Basics

A file tucked away on a disk seems safe and sound; after all, the command reads "Save," not "Save until some unforeseen event." But the worst does happen. Disks are damaged or lost. Programs turn kamikaze, crashing and taking files with them. Power surges give hard disks amnesia. Fires start, and sprinkler systems sprinkle. Equipment is stolen. It's enough to make you want police protection, but only a faithfully followed backup strategy can help.

Copying floppies

The techniques described in the Step-by-Step box "Copying a Floppy Disk" copy every file from your original floppy disk to the backup disk. As you work with the original (don't forget to unlock it first), you'll probably add to it or modify its files. You have two alternatives for keeping your backups up to date. You can drag only the new or modified files to the backup (clicking OK when asked if you want to replace the existing files), or you can simply recopy the entire disk. The latter takes longer, but is easier because you don't have to keep track of which files you modified or added.

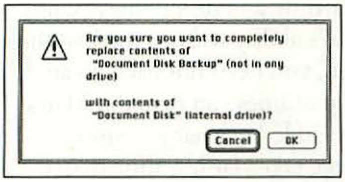
Use the Finder's By Date command (it's in the View menu) to look at the original disk's contents sorted according to their creation and modification dates, and then copy only those files with dates past the backup date. You can also determine when a file was created and modified by selecting the file and choosing Get Info from the File menu or pressing ⌘-I. As I mentioned in Chapter 23, you can also use the Finder's Find command to locate all files modified on a given day, and then back up the files by dragging them to a floppy or removable-media cartridge.

How often should you back up a floppy disk that you use to store documents? As often as necessary for your work habits and your peace of mind. If you're using a disk constantly, you may want to back it up every day. The best rule may be to back up anything you aren't willing to re-create.

STEP-BY-STEP

Copying a Floppy Disk

Backing up floppy disks is easy — and important. When you buy a new program, your first step should be to make copies of the disks it came on (for backup use only — copying a commercial program for or from someone else is stealing). The instructions in this box show how to copy a floppy disk on a Mac with one or two floppy drives. If your Mac has just one drive, the floppy copy routine is a bit tricky. To avoid excessive disk swapping, use the following steps.

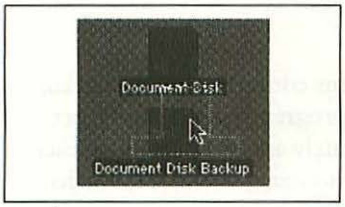


Are you sure you want to completely replace contents of "Document Disk Backup" (not in any drive)

with contents of "Document Disk" (internal drive)?

To copy a floppy disk on a Mac with one floppy drive:

1. **Insert the backup disk (not the original) and then choose Eject from the Finder's File menu.**
   The Finder dims the disk's icon to indicate it still "knows" about the disk.
2. **Lock the original disk.**
   To lock the disk, slide its plastic write-protect tab so you can see through the square hole.
3. **Insert the original disk, and then drag its icon to the backup disk's dimmed icon.**
   The Finder asks if you want to replace the backup disk's contents.
4. **Click OK.**
   You will need to swap disks a few times during the copying process.



To copy a floppy disk on a two-drive Mac:

1. **Lock the original disk.**
   To lock the disk, slide its plastic write-protect tab so you can see through the square hole.
2. **Insert the original disk in one drive and the backup in the other.**
   Both disk icons appear on the desktop.
3. **Drag the original disk's icon to the backup's icon.**
   The Finder asks if you want to replace one disk's contents with those of the other; click OK. When the copy is complete, eject both disks; unlock the original if you plan to write to it again.

Hard disks are harder

Backing up a hard disk is, well, harder. A hard disk may streamline your day-to-day computing, but it turns into a ball and chain at backup time. A hard disk can hold thousands of files, making the job of backing up modified files a logistical nightmare. Yet backing up a hard disk couldn't be more important. If you use a computer extensively, a hard disk tends to become a magnetic representation of your life. It's all there — your business plans, personal letters, drawings, programs, and more — and losing it in one fell swoop is about as traumatic an experience as you can have sitting in front of a computer.

To back up a full 80MB drive, you need nearly 60 disks — and about an hour. Most people can think of better ways to spend their time and disk money. Until their hard disks crash, that is. But thanks to the Mac's ability to keep track of the date and the time that files are created and modified, you need not back up an entire hard disk during each backup session. Backup utilities can read the Mac's digital datebook and back up only those files you've added or changed since the last *full backup*. This task, called an *incremental backup*, takes far less time than a full backup.

Backup Helpers

Several software firms offer backup programs that work with any SCSI hard disk. Examples include Dantz Developments' Retrospect and DiskFit series, Inline Design's Redux, and Fifth Generations' Fastback series. Backup programs are also included with Symantec's Norton Utilities for Macintosh and Central Point's MacTools disk utility packages.

The most basic difference between backup programs concerns how the backup program copies files to your backup media. Some programs, including Dantz Development's DiskFit series, copy each file separately and then create on each backup disk a catalog file that the program can use to *restore* the files to the hard disk. On the backup disks you can see each file just as it existed on your hard disk. Need to restore a few files? Simply use the Finder to copy them from the backups to your hard disk. (If a given file won't fit on a single disk at backup time, the utility splits it across multiple disks; you must use the utility to restore such a file.)

Other programs, including Fifth Generation Systems' Fastback series, Dantz Development's Retrospect, and Inline Design's Redux, copy your files into one large file that spans all your backup disks. Instead of using the Finder, you run the backup utility and tell it to locate and restore the files you need. (Fastback Plus offers an option that lets you save backups as individual, Finder-readable files.)

Comparing backup approaches

With the separate-files approach used by DiskFit, you can restore any file that fits on a single backup disk without having to run the backup utility. You'll appreciate that if the utility's master disk becomes damaged, or if you take your backup disks to another machine but forget to take along a copy of the utility.

With the one-file-holds-all approach, if you don't have the backup utility, you don't have any backups — but it does make possible faster back-up sessions and some fancy backup gymnastics. Many programs, for example, can compress files as they back them up, reducing the number of backup disks required.

Incremental differences

Another factor to consider is whether a backup program saves or deletes older versions of files you back up. For example, say you begin writing a proposal on Monday morning and then do a full backup on Monday evening. You work on the proposal again on Tuesday and then do an incremental backup. What happens to the backup of Monday's version?

It depends on the program you use. DiskFit and Redux replace older versions of files with their newer versions. That keeps your mountain of backup disks from growing too high, but it also eliminates the option of going back a few days to an earlier version of a file. If you decide Tuesday's version of your proposal stinks — or worse, if your word processing program somehow scrambles the file, and you unknowingly back up the scrambled version — you don't have Monday's version to fall back on. (I'll present a workaround for this potential nightmare shortly.)

By contrast, Retrospect and Backmatic don't replace earlier versions of files. Fastback Plus lets you choose whether older versions should be deleted or saved. That gives you an extra-strong safety net, but it also means you need more disks to hold your backups. That can be significant if you're backing up large files such as scanned images, digitized sounds, or QuickTime movies.

Choosing Your Backup Weapon

Here are some other points to address before buying a backup utility:

- *Network support* If you use network file-server software such as AppleShare (discussed in Chapter 33), you'll want a backup utility that backs up each folder's access privilege information. Programs that do include Retrospect Remote, DiskFit Pro, and TerraNetics' SafeDeposit.

- *Backup selectivity* If you're willing to rely on your original application disks as backups, you can back up documents only and cut your backup time. But some programs give you more flexibility than others in choosing files to back up.
- *Specialized media support* If you plan to use a backup medium other than floppy disks, be sure to buy a program that supports your chosen medium. (To find out what other media are available, see the Background box "Media Circus.") Retrospect can back up to virtually anything. Fastback II, DiskFit, and Redux support tape drives, as long as they display tapes as icons on the Finder's desktop.
- *Unattended operation* If you use a file server in a busy office, you may want to back it up at night, when it's idle. Fastback Plus, DiskFit Pro, Norton Backup, and Retrospect are among the utilities that let you specify intervals for unattended backups (see Figure 27-1 "Scheduled Maintenance"). But because no one will be around to shuffle floppy disks, you'll need to use a high-capacity backup medium such as a second hard disk or a tape drive.
- *Programmability* If you have very specific backup needs — perhaps you want to back up all PageMaker and Excel documents at 8 p.m. every Tuesday — consider a program that lets you automate the types of backups you do. Retrospect, Fastback Plus, and Redux offer the strongest automation features.
- *Ease of use* Backing up is boring; a program that's difficult to learn won't encourage the practice. Alas, ease of use and power are at opposite ends of the seesaw. The two most powerful backup programs — Fastback Plus and Retro-

BACKGROUNDER

Media Circus

If your hard disk holds more than about 40MB — or if you lack the patience for shuffling floppy disks — consider an alternative backup medium. One possibility is a second hard disk. Today you can buy two 100MB drives for less than what one 40MB drive cost a few years ago. And you'll have a spare drive if the first one acts up.

Another alternative is a tape drive, whose primary strength is capacity. Some tape drives store between 40MB and 300MB on cassette-like tape cartridges. Other drives use 8mm video cassettes or digital audio tape (DAT) cassettes that hold over 2000MB. Their primary weakness: performance. As mentioned in the previous chapter, locating a specific file on a tape cartridge can be slow because the drive can't randomly access any point on the tape.

As I described in Chapter 26, the most versatile backup device is a removable-media drive built around an Iomega Bernoulli or SyQuest mechanism. Removable-media drives combine a hard disk's speed and capacity with the insert-and-eject convenience of floppy disks. And unlike tape drives, removable-media drives can be used as a primary storage device. Bernoulli and SyQuest drives are also available in dual-drive units that allow convenient, cartridge-to-cartridge backup.

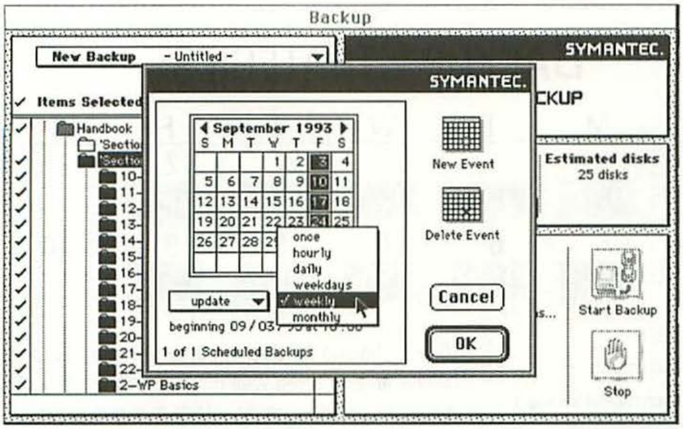


Figure 27-1: Scheduled Maintenance Numerous programs can do automatic backups at regular intervals — provided your backup medium can hold all the files that will be copied. Shown here: the scheduling option of Symantec's Norton Backup, included with Norton Utilities for the Macintosh.

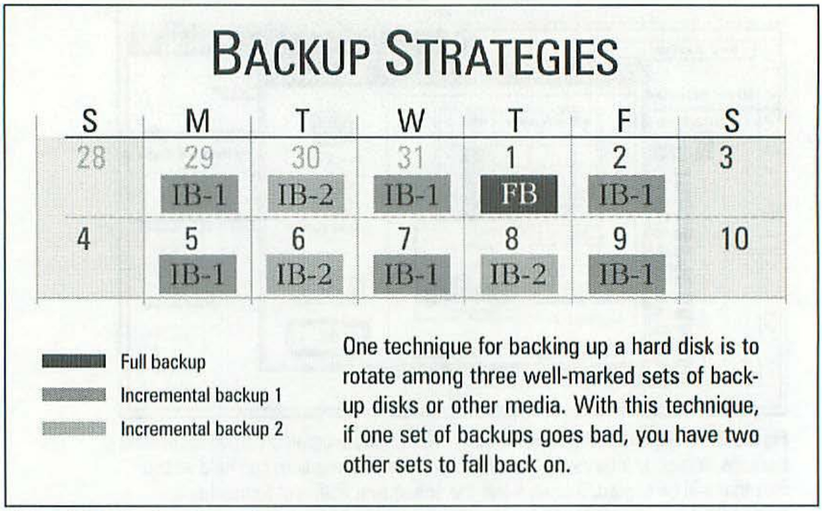
spect —have fairly steep learning curves. If your backup needs don't demand automation and sophisticated file-selection features, consider a simpler program. Redux, Fastback Express, and the DiskFit series strike a balance between power and simplicity. The backup utilities that accompany Symantec's Norton Utilities and Central Point's MacTools are also straightforward and easy to use.

Backup Plans

How will you use your backup program? You'll probably start by doing a full backup, following up with incremental backups at regular intervals. Here are some guidelines and tips.

Make two backups

Your backup disks are prone to the same ailments as your originals. For extra safety, make two backups, and alternate them (see Figure 27-2 "Backup Strategies"). And don't store your backups along with your computer. Fire or water won't discriminate between the originals and the backups, and chances are a thief won't either. Practice what the data processing industry calls *off-site storage.* Keep your backups separate — in a different room, at home, at the office, in a fireproof box, or, if you want real security, in a safe deposit box.



BACKUP STRATEGIES

S	M	T	W	T	F	S
28	29 IB-1	30 IB-2	31 IB-1	1 FB	2 IB-1	3
4	5 IB-1	6 IB-2	7 IB-1	8 IB-2	9 IB-1	10

■ Full backup
▨ Incremental backup 1
▨ Incremental backup 2

One technique for backing up a hard disk is to rotate among three well-marked sets of backup disks or other media. With this technique, if one set of backups goes bad, you have two other sets to fall back on.

Figure 27-2: Backup Strategies

Use the Mac's disk cache

Most backup programs run faster when the Mac's disk cache is on. If your program's manual doesn't provide cache-size guidelines, try 64K. In System 7, use the Memory control panel. (In System 6.x, use the Control Panel's General option to set the cache.) With all system versions, you must restart your Mac after adjusting cache settings to make them take effect.

Create an emergency-restore floppy disk

If your hard disk crashes, you can start up with this floppy disk and use it to restore your files. (Depending on how your hard disk crashed, you may first need to reinitialize it using the software that accompanied it.) If your Mac has a SuperDrive floppy disk drive (all Macs made after August 1989 do), use the System 7 installer to create a minimum installation. (Click the Installer's Customize button, and then select the Min System option for your Mac model.) Some utilities, including Symantec's Norton Utilities, include emergency start-up floppy disks for SuperDrives and 800K drives alike. These floppy disks may not work on the newer Macs that use system enablers (described in Chapter 23).

Don't forget customized files

To save time and space on your backup media, you may want to tell your backup program to ignore files in the System Folder. That's generally a safe approach — if you remember to occasionally back up the customized files that live in the System

Folder. Such files include word processor spelling-checker dictionaries that contain your own entries, preferences files that store your application preferences, the Scrapbook file, the System 7.1 Fonts folder, and in system versions 7.0 and earlier, the System file itself.

Verify your backups

Most backup utilities have a *verify* option, which, when active, causes the program to proofread its work as it backs up files. If a disk error causes a file to be written inaccurately, the verification process catches it, and the utility tries again. Verification lengthens the backup process, but that's a small price to pay for more reliable backups.

When to Restore

When do you need to restore the files from the backup disks to the hard disk? The obvious answers: after losing an important file or reformatting the hard disk, which may be necessary after a power failure or kamikaze program crash; after having a hard disk repaired, during which time it was probably replaced or reformatted; or if you're switching to a different hard disk or want a colleague to have a large number of your files.

Another incentive to restore is to improve the hard disk's performance. When you delete files from a disk (hard or floppy), the Mac frees their space for new files. When you save a large file or copy an application to the disk, the Mac, in its zeal to reuse the freed space, may save the file in pieces — scattered across physically separate tracks on the hard disk instead of in contiguous tracks. It takes longer for the drive's magnetic heads to leap between separate tracks than to stroll from one track to the next. As you continue deleting and adding files, performance begins to suffer as the drive's heads waste time thrashing around the disk saving or reading fragmented files.

To restore a hard disk so that its files are stored contiguously, first make a full backup (or two, for safety), and then reformat the entire hard disk. Next, restore the system files, the applications, and then the folders and documents in that order. Performing the restoration process in this order ensures that the frequently accessed system and application files will be stored contiguously.

Disk Doctors

What happens if you lose a file in between backups? If you're smart, you'll reach for a file-recovery utility such as Symantec's Norton Utilities for the Macintosh, Fifth Generation's Public Utilities, or Central Point's MacTools Deluxe. These products can often repair and resurrect damaged disks and files. They do so by working intimately with the reserved areas of a disk — areas that don't store documents or applications but instead hold information the Mac uses to keep track of files.

Reserved areas have technical names like volume allocation bitmap and extents b-tree. The Mac takes these magnetic tables of contents at face value; it assumes they're intact and contain valid data. When they don't — when a system crash, program bug, or stray magnetic field scrambles their contents — the Mac may be unable to retrieve part or all of the disk's contents. File-recovery utilities can analyze these areas, often correct inaccurate entries, and thus retrieve files that the Mac thinks are gone (see Figure 27-3 "Recovery Tool").

Rescuing trashed files

The aforementioned products can also save the day when you accidentally throw away a file. All three include extensions that spy on you as you use a disk. When you delete a file, the extension makes notations on disk that indicate where that file is physically located on the disk. The file is still there; the Mac has simply removed its entry from the disk's electronic table of contents. Should you need to resurrect the file, you run the file-recovery utility, which reads those notations and re-creates the file's table of contents entry. (Prosecutors for the Iran-Contra trial used similar techniques to resurrect memos Oliver North *thought* he'd deleted from his word processor.)

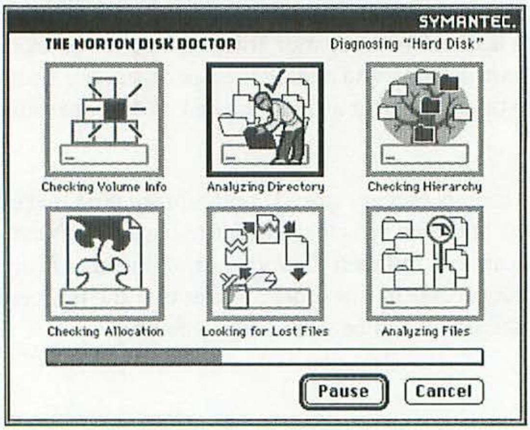


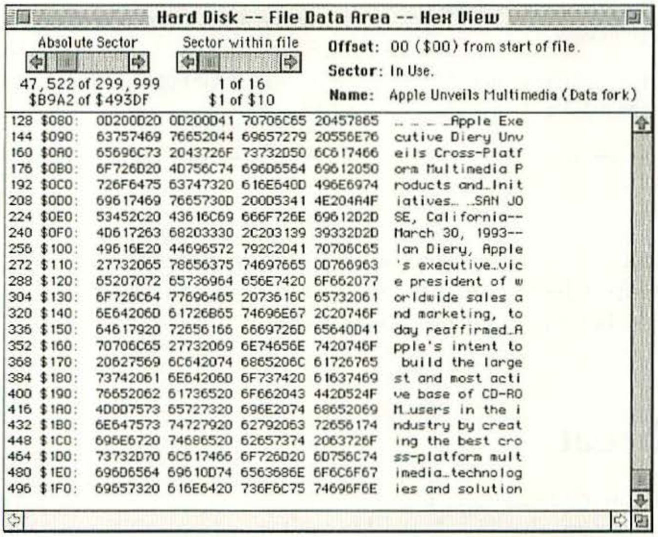
Figure 27-3: Recovery Tool A software rescue squad in action — Symantec's Norton Utilities for Macintosh.

But there is a catch: If you worked extensively with the disk after deleting the file, some of its contents may have been replaced by newer files. So when you realize you've accidentally deleted a file, stop using that disk until you can run the recovery utility. Even if a recovery utility can't automatically resurrect a file, there's still hope. Most products include *disk editors,* which let you directly view and alter the disk's contents (see Figure 27-4 "Disk Editing").

Good health habits for disks

The previous paragraphs contain several *oftens* and *maybes*. The fact is, file-recovery utilities don't always succeed. A visit to a doctor isn't a substitute for good health habits, nor can a file-recovery utility replace a good backup routine.

And speaking of good health habits, keep disks — floppy or hard — away from excessive moisture, stray magnetic fields, extremes of heat or cold, and dusty environments (see the Quick Tips box "An Ounce of Prevention"). Pack them securely for shipping. (Save your hard disk's original box or your Mac's box, if you have an internal drive.) If you move them from one temperature extreme to another, give the disks time to acclimate before using them. And never move or jostle a hard disk while it's on.



```
Absolute Sector          Sector within file   Offset: 00 ($00) from start of file.
47,522 of 299,999        1 of 16              Sector: In Use.
$B9A2 of $493DF          $1 of $10            Name:   Apple Unveils Multimedia (Data fork)
128 $080:  0D200D20 0D200041 70706C65 20457865  … … … …Apple Exe
144 $090:  63757469 76652044 69657279 20556E76  cutive Diery Unv
160 $0A0:  65696C73 2043726F 73732D50 6C617466  eils Cross-Platf
176 $0B0:  6F726D20 4D756C74 696D6564 69612050  orm Multimedia P
192 $0C0:  726F6475 63747320 616E640D 496E6974  roducts and…Init
208 $0D0:  69617469 7665730D 200D5341 4E204A4F  iatives… …SAN JO
224 $0E0:  53452C20 43616C69 666F726E 69612D2D  SE, California--
240 $0F0:  4D617263 68203330 2C203139 39332D2D  March 30, 1993--
256 $100:  49616E20 44696572 792C2041 70706C65  Ian Diery, Apple
272 $110:  27732065 78656375 74697665 0D766963  's executive…vic
288 $120:  65207072 65736964 656E7420 6F662077  e president of w
304 $130:  6F726C64 77696465 2073616C 65732061  orldwide sales a
320 $140:  6E642060 61726B65 74696E67 2C20746F  nd marketing, to
336 $150:  64617920 72656166 6669726D 65640D41  day reaffirmed…A
352 $160:  70706C65 27732069 6E74656E 7420746F  pple's intent to
368 $170:  20627569 6C642074 6865206C 61726765   build the large
384 $180:  73742061 6E642060 6F737420 61637469  st and most acti
400 $190:  76652062 61736520 6F662043 4420524F  ve base of CD-RO
416 $1A0:  4D0D7573 65727320 696E2074 68652069  M…users in the i
432 $1B0:  6E647573 74727920 62792063 72656174  ndustry by creat
448 $1C0:  696E6720 74686520 62657374 2063726F  ing the best cro
464 $1D0:  73732D70 6C617466 6F726D20 6D756C74  ss-platform mult
480 $1E0:  696D6564 69610D74 6563686E 6F6C6F67  imedia…technolog
496 $1F0:  69657320 616E6420 736F6C75 74696F6E  ies and solution
```

Figure 27-4: Disk Editing When a file-recovery program's automatic recovery features fail you, turn to its disk editor (that of the Norton Utilities is shown here). By searching for text present in the lost file, you may be able to locate some or all of its data and copy it to a new file — or at least retype it. The four-character columns in the left portion of the display show each character's hexadecimal value, while the rightmost column shows the characters themselves.

An Ounce of Prevention

Here are some tips for taking care of floppy disks.

- ❖ Keep disks away from magnetic fields. That includes audio speakers, electric motors, telephones, high-intensity desk lamps, and yes, magnets.
- ❖ Keep disks comfortable. Don't leave them in a sun-baked car or near a radiator or other heat source. If you bring a disk or removable cartridge into a warm building on a winter's day, allow it to warm up to avoid condensation forming on its surface and damaging the drive.
- ❖ Don't place a hard drive or an external floppy disk drive to the left of a Mac Plus or SE. Don't store floppies there, either. The power supply in these Macs generates magnetic fields that can cause disk errors. Apple fixed this problem in the Classic and later compact Mac models.
- ❖ Be gentle. Don't slide a disk's shutter open and touch the inside. Don't trust a disk's plastic case to protect the disk in the mail; cardboard disk mailers are available at office-supply stores.
- ❖ Buy quality disks. You've made a big investment in your Mac and an even bigger investment in the documents you create and the programs you buy — don't skimp on something as relatively inexpensive as a disk. With 800K drives, use disks certified for double-sided operation. Don't attempt to punch a hole in an 800K drive in order to use it in a high-density SuperDrive. The disk may work for a short time, but it will probably fail. And plastic shavings may damage the floppy drive.
- ❖ Use the write-protect tab to guard against accidental erasure. Slide the tab away from the disk's shutter to lock the disk. You can see straight through the write-protect hole of a locked disk. The Finder indicates a locked disk by displaying a padlock icon in the upper-left corner of the disk's window.

Following these common-sense precautions can lessen the chances that you'll need to restore data from backups or use a recovery program. In short, disks may be fair-weather friends, but you can control the weather.

The Virus Threat

Have you had any viruses lately? I refer not to the cold-and-flu variety, but to *computer viruses,* programs that invade the Mac and slow its performance, cause system errors, or — at their most evil — destroy applications and documents.

The term *virus* implies a natural entity that you can't help but pick up now and then, like a cold. The truth is, computer viruses are tools of vandalism — they're bricks heaved through your Mac's windows by people with apparently nothing better to do with their time and programming skill. No cures exist for the viruses that cause colds, but computer viruses could be stopped dead if their creators turned their energies toward being productive, not destructive.

But then, so could war, crime, and pollution. And like them, viruses will be around for some time. What can you do? First, don't lose any sleep over viruses. They exist, but your chances of being victimized by one are small, especially if your Mac isn't on a network and you don't swap software with other users. Second, be prepared — just in case. Arm yourself with knowledge of how viruses spread, of their symptoms and remedies, and of the measures you can take to avoid them.

It came from Ohio

Some of the technical concepts behind viruses have been around for decades, but the first microcomputer viruses appear to have been created in 1983 by Frank Cohen, a University of Cincinnati professor who was researching his doctoral thesis on computer security. Cohen's viruses were created under controlled conditions; none reached the outside world. Interviewed in 1988, when viruses enjoyed a burst of media attention, he admitted to being reluctant to publish his findings, but did so to warn the world of the virus threat. "I had planned to devote my thesis to ways to defend against viruses," he said. "Instead, I used it to prove that you can't defend against them."

Viruses are difficult to fight because they're designed to spread. A virus contains software instructions that enable it to copy itself into legitimate files, called *hosts*. Some viruses infect only application files, while others invade documents or the Mac's system files. Still others begin by infecting a system file and then copy themselves to uninfected applications.

How viruses spread

Most viruses spread when you copy an infected file from one Mac to another, although some spread simply when you insert an infected floppy disk. Now imagine millions of Mac users exchanging files through user groups, office and university networks, and on-line bulletin boards and information services — the propagation possibilities are endless. In 1989, a new virus was discovered in Belgium in early December; by Christmas of that year, it had spread throughout the United States.

A virus doesn't just replicate itself, it also inflicts its own unique symptoms on the machines it infects. Viruses can be malicious or mischievous. A malicious virus may deliberately damage applications, cause system errors, or erase files on a hard disk. A mischievous virus may simply display a message or joke at a predetermined time; its creator is out to soap your windows, not smash them. To date, most Macintosh viruses have fallen into this second category.

But even a mischievous virus can be trouble. It may cause a system error by trying to use memory or resources that a legitimate program is already using. Its programmer may not have tested it thoroughly, or it may conflict with your Mac's combination of hardware and system extensions. The bottom line: There's no such thing as a benign virus.

Names and strains

Most Mac viruses have odd-sounding names — nVIR, Hpat, INIT29 — that reflect the technical makeup of the virus's software. Others are named after their discoverers — Don Ernesto Zucchini was reportedly the first victim of the ZUC virus. Some viruses earn more pronounceable monikers, such as the "Peace" virus, set loose by an attention-hungry editor of a Canadian Mac magazine. It was designed to display a "universal message of peace" on March 2, 1988, and then erase itself. Its victims — including Aldus Corporation, which inadvertently shipped a few thousand infected copies of FreeHand — didn't find the medium appropriate to the message.

Now and then a new strain of an existing virus appears. That's been the case with the nVIR virus, whose original program code was once posted on a computer bulletin board in an attempt to aid creators of antivirus software. It may have helped them, but it also gave budding virus creators a head start in creating new strains.

Table 27-1 "Field Guide to Viruses" lists the names and symptoms of the viruses that have been identified as of mid-1993.

Is your Mac at risk?

Generally, the more Macs your machine comes in contact with, the greater the risk of infection. Consider yourself at risk if any of the following describe you:

- ❖ You swap programs, HyperCard stacks, or disks with other Mac users. Even an erased disk can carry the WDEF virus if you erase the disk by dragging its contents to the Trash. If a friend hands you a blank disk to fill with your latest shareware finds, be sure the disk was erased using the Finder's Erase Disk command before you insert it into your Mac.
- ❖ You download programs and HyperCard stacks from bulletin boards or information services. Most bulletin boards and information services check incoming files for viruses before making them available to subscribers, but a new virus can slip through undetected if the service's virus-detection software can't recognize it.
- ❖ You're connected to other Macs on a network. A network is an ideal transmission medium for viruses, especially if several users access applications stored on a file server.

Table 27-1
Field Guide to Viruses

Virus Name	*Nature of Infection*	*Symptom*	*Comments*
ANTI, ANTI-B, ANTI-ange	Infects applications only (including the Finder), not other system files or documents.	Nondestructive but may cause crashes due to its poor programming.	Disinfected applications aren't identical to original, but generally still run. Best approach is to replace infected application with an uninfected copy from its master disk.
CDEF	Infects DeskTop file only, not system files, programs, or documents.	Slows performance. AppleShare server performance slows significantly.	You can remove this virus from an infected disk by rebuilding its DeskTop file: Press `1` and Option while inserting the disk. For hard disks, restart and hold down `1` and Option until the rebuild dialog box appears. To avoid infecting an AppleShare server, do not grant the "make changes" privilege to the server's root directory (desktop level).
CODE 252	Under System 7, generally infects only the System file. Under System 6 without MultiFinder, it can spread to applications. Spreads only between January 1 and June 5 of any year.	If an infected system is started up between June 6 and December 31 of any year, the virus displays the following message: "You have a virus. Ha Ha Ha Ha Ha Ha Ha Now erasing all disks... Ha Ha Ha Ha Ha Ha Ha P.S. Have a nice day."	No disks are actually erased, but its sloppy programming can cause crashes and damaged files.
Frankie	Infects applications, not documents or system files. Infects only Atari computers containing certain Mac emulator hardware.	Draws bomb icon, displays the message, "Frankie says: No more piracy," and then crashes.	Very rare. Doesn't infect genuine Macs.
INIT 29	Infects any file (document or application) containing resources. Spreads only via applications and System files.	Its poor coding may cause printing problems, extension conflicts, and crashes. If you insert a locked floppy disk, a dialog box appears saying the disk needs repairs. Normally, this dialog box doesn't appear with locked disks.	INIT 29 can spread very rapidly because it infects unlocked floppies as soon as they are inserted.

(continued on the next page)

Table 27-1 *(continued)*

Virus Name	*Nature of Infection*	*Symptom*	*Comments*
MBDF	Infects applications and various system files	May cause menu-related problems. Lengthens startup process.	This virus originally spread via three Trojan horse games: "10 Tile Puzzle," "Obnoxious Tetris," and "Tetricycle." Its creators, two Cornell University students, were caught and convicted of second-degree computer tampering.
MDEF (strains A, B, and C; also called Garfield)	Infects applications, various system files, and documents.	System crashes. On Macs using CE Software's Vaccine, MDEF-A causes menus to work only in infected applications.	Often infects DeskTop, DA Handler, and Finder files. Strains B and C attempt to bypass watchdog INITs.
INIT 1984	Infects system extensions only, spreading from one extension to another during startup.	Severely damages files and folders on infected Macs that are started up on any Friday the 13th.	The Disinfectant utility detects and neutralizes this malicious virus.
INIT 17	Infects the System file and then application files. Does not infect documents.	Displays the message, "From the depths of Cyberspace" the first time an infected system is started after 6:06:06 AM on October 31, 1993.	Sloppy programming can cause system crashes, especially on 68000-based Macs such as the Classic, SE, and Plus.
INIT-M	Infects all types of files; spreads and attacks under System 7 only.	Severely damages files and folders on infected Macs that are started up on any Friday the 13th. Can cause windows to display improperly. One file or folder on a victimized disk may be renamed to "Virus MindCrime."	Creates a file called FSV Prefs in the System Folder's Preferences folder. The next three Friday the 13ths are in August 1993, May 1994, and January 1995.
nVIR (strains A and B)	Infects System file first, adding code that subsequently infects each application you run. Finder and DA Handler files usually become infected.	System crashes. Files may disappear. Mac may beep when applications are started. "B" strain causes Mac to say "Don't panic" if System Folder contains the Macintalk file. Otherwise, you may hear random system beeps.	The original program code for nVIR was posted on some bulletin boards and information services. As a result, several clones have appeared: Hpad, nFLU, AIDS, MEV#, and F***, whose actual name can't be printed here. Their symptoms are generally the same.

(continued on the next page)

Table 27-1 *(continued)*

Virus Name	***Nature of Infection***	***Symptom***	***Comments***
Peace (also called MacMag, Drew, and Brandow)	Infects System file.	"Message of peace" appeared on March 2, 1988; virus then destroyed itself.	Rare these days, but still could be encountered on old disks.
Scores	Infects System file first, lies dormant for two days, then searches for and infects a new application at 3 ½ minute intervals. Adds invisible files called Scores and Desktop_ (the _ character represents a space) to the System Folder.	System crashes; printing problems. Miscellaneous problems with MacDraw and Microsoft Excel. May cause insufficient memory messages. Increases size of files it infects by 7K. Notepad and Scrapbook files may have generic document icons (dog-eared page).	System 6.0.4's System file is irrepairably damaged and must be replaced with an uninfected copy from its master disk.
T4 (strains A, B, C, and beta)	Infects the Finder and applications. Also attempts to alter the System file.	Mac crashes during startup while loading extensions. Sometimes renames files to Disinfectant. May display the message "Application is infected with the T4 virus."	Originally spread via a game called GoMoku. Disinfected applications are damaged and must be reinstalled. Various strains are similar, but are triggered on different dates.
WDEF (strains A and B)	Infects only the invisible DeskTop file contained on all floppy and hard disks. Spreads rapidly through the sharing of floppy disks.	Crashes Mac IIci and Portable. "B" strain causes Mac to beep each time a DeskTop file is infected.	See CDEF comments.
ZUC (strains A and B)	Infects applications only, not other system files or documents.	Strange pointer movement when the mouse button is down—the pointer moves and bounces off the screen edges like a billiard ball. Can cause desktop pattern to change.	Applications don't have to be run to become infected. Spreads over networks.

- You use a desktop publishing service bureau or university laser-printer center. Some service bureaus have been criticized for taking a cavalier attitude toward virus checking and prevention. If you use a bureau or central printing station regularly, look into its virus-prevention measures.

Protecting Your Mac from Viruses

If you don't fall into the preceding categories, you aren't immune from viruses, but the threat is minimal. Whether or not you're in the high-risk group, here's how to protect yourself.

Lock floppy disks whenever possible

A virus can't infect a locked disk. *Always* lock the original master disks of an application before inserting them; you'll need virus-free masters in case one of your programs gets infected. To lock a disk, slide its plastic write-protect tab so you can see through the square hole.

Back up religiously

If the worst happens, you'll have something to fall back on — unless the backups are infected, too. To avoid that, keep at least two sets of alternate backups made at different times. Don't neglect to back up the files in your System Folder, too; most viruses attack them first, and by having a backup, you won't have to laboriously reconfigure your System Folder.

Be wary of freeware and shareware

Instead of trustingly copying it to your hard disk, run a freeware or shareware program from a floppy disk first and watch for abnormal behavior, such as system crashes or significantly slowed performance. Use the General Controls control panel or Alarm Clock desk accessory to change the Mac's date setting, and then run the program again; some viruses lie dormant until a certain amount of time passes. (The Scores virus, for example, waits four days before doing some of its dirty work.) Bypassing your hard disk protects you from *Trojan horse* programs, which appear to be legitimate applications, but which damage or erase files when you run them (see the Background box "Attack of the Trojan Horses").

Protect your networks

Only applications known to be uninfected should be copied to a network file server. If you're in charge of running a server, establish guidelines to prevent anyone else

BACKGROUNDER

Attack of the Trojan Horses

A Trojan horse differs from a virus only in that it isn't designed to spread by replicating itself; if a Trojan horse strikes, you can prevent future problems by deleting it (unless the Trojan horse *installs* a virus, as do the Tetricycle and Tetris-Rotating horses). Trojan horses have been relatively rare in the Mac world, but there are several out there.

- Mosaic and FontFinder surfaced in early 1990 on a bulletin board system in Canada. They appear to be utility programs, but when run, they erase the directory of the Mac's hard disk and display a message: "Gotcha." (Isn't it amazing how uncreative software vandals are?)
- Steroid appeared later in 1990. It's an extension that promises faster screen displays on Macs with 9-inch, built-in screens. It wipes out disks.
- Sexy Ladies may have been the first well-known Mac Trojan horse. It's a HyperCard stack that displays cheesy images while erasing data from the disk it's stored on.
- CPro 1.41 claimed to be an updated version of Bill Goodman's Compact Pro file-compression utility. It wasn't. When run, it erases your start-up hard drive and any floppy disk that might be inserted.
- ChinaT claims to be an extension that provides text-to-speech capabilities (Apple's text-to-speech software was code-named Gala Tea). The only speech ChinaT generates is cursing: It erases hard disks.
- Tetricycle or Tetris-Rotating claim to be games, but merely install the MBDF virus (described in Table 27-1 "Field Guide to Viruses").
- An unnamed Trojan horse (called Unnamed PostScript Hack in some virus literature) doesn't damage your Mac; it damages your PostScript printer by changing its internal password. Several free utilities are available that protect against this.

from copying programs to the server. Also consider using the file server for document storage only, and running applications from local hard or floppy disks (not a bad approach in any case, given the less-than-blazing speed of LocalTalk cabling).

Consider using more than one

There are programs you can use to scan suspect disks for viruses, remove viruses from infected programs, and guard against future infection. They're often described as the vaccines of the computer world, but the truth is, they're more like chicken soup — not guaranteed cures, but certainly worth trying if you're at risk.

If you suspect a virus infection, see the Quick Tips box "When Infection Strikes" for some tips on what to do.

QUICK TIPS

When Infection Strikes

Your Mac is acting up. Should you suspect a virus? Not at first, unless the problem is a dialog box containing a universal message of peace. Most system errors or other problems can be traced to nonviral causes — conflicting system extensions, a damaged disk, loose or damaged printer cables, or application bugs (see Chapter 29 for more troubleshooting advice). I learned this the hard way a while back: I spent two days trying to eradicate an WDEF infection after my system slowed to glacial pace, but the problem turned out to be conflicting system extensions. It goes to show that even the threat of a virus infection can impair your productivity.

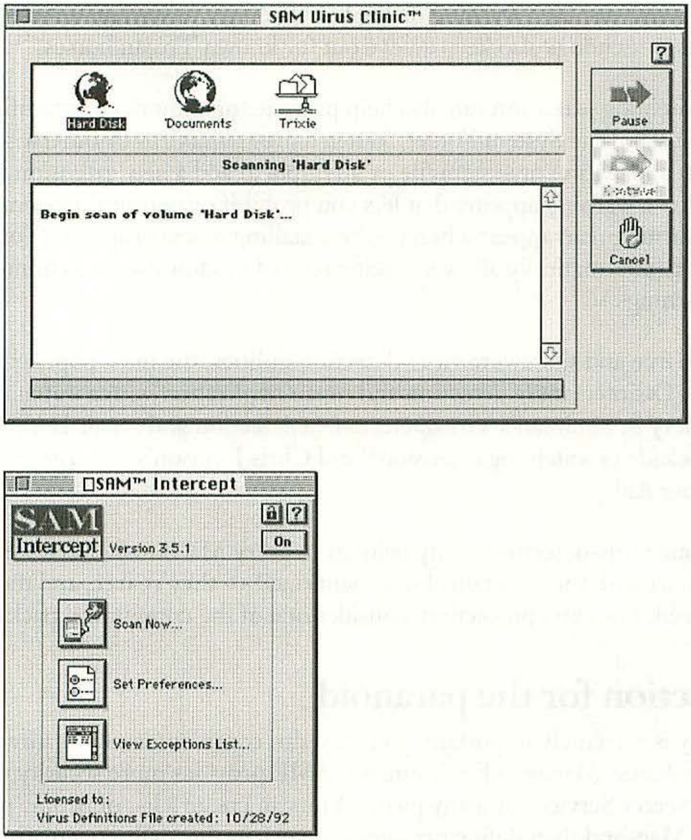
After you've eliminated non-viral possibilities, compare your list of symptoms to those in Table 27-1 "Field Guide to Viruses." Run John Norstad's Disinfectant and any other virus detectors you may have. If the detection utility identifies an infection, perform the following steps:

- *Isolate the patient* If you're on a network, disconnect your LocalTalk connector where it attaches to the Mac's printer port. Inform other members of the network before disconnecting your Mac, and be sure they know your machine is infected — theirs probably are, too.
- *Replace the infected files* You did back up yesterday, didn't you? If you don't have healthy backups, use a virus utility to try to repair the damaged files. First, because the disinfecting process itself can damage the files, back up the files the utility says are infected; copy them to floppy disks and be sure to clearly label those disks as infected. If one utility fails to repair the files, try another. If you can't fix a file, delete it. After you successfully repair or delete all infected files, run the detection utility again.
- *Erase the infected disks* Don't use the Finder to erase the disks; you may reintroduce the virus when you insert an infected disk. Instead, use a magnetic bulk eraser such as Radio Shack's catalog number 44-232. A bulk eraser uses a strong magnetic field to scramble the disk's microscopic magnets, so don't use it near your good disks.

Mac Medicine

After the Big Mac Viral Epidemic of 1988 (which snared more media attention than victims), programmers on the side of law and order began developing ways to detect, disable, and prevent viruses. Today, you can choose from several commercial virus-detection utilities and nearly a dozen shareware or free ones.

The commercial packages — Datawatch's Virex, Symantec's SAM II, Microseed's Rival, and Central Point's Anti-Virus for Macintosh — include an application program for scanning suspect disks and repairing infected ones, and a *watchdog* extension, which can help prevent infections (see Figure 27-5 "Virus Hunt").



Scanning 'Hard Disk'

Begin scan of volume 'Hard Disk'...

Version 3.5.1

Licensed to:

Virus Definitions File created: 10/28/92

Figure 27-5: Virus Hunt Commercial virus-detection utilities include a scan-and-repair application (top) and a watchdog extension such as Symantec's SAM Intercept (bottom). When a program attempts to modify a file in the way that a virus would, a watchdog extension displays a dialog box that lets you grant or deny access to the file.

Scanning for viruses

It's a good idea to use a virus-detection application's scan mode to check for viruses before backing up. Virex also has a Record/Scan command that saves information about the size and contents of one or more files. If you suspect infection, run the Record/Scan procedure again, comparing the results with the first scan. This is a useful way to spot a new virus that the utility may not otherwise detect.

Watchdog extensions provide several lines of defense against future infections. They automatically scan a newly inserted floppy disk for viruses; if one is found, you can eject the diseased disk and throw it away or you can try to repair it. The extensions also display a warning dialog box if you try to start an infected application. Some watchdogs also keep an eye out for known Trojan horses.

SAM's watchdog extension can also help prevent "unauthorized" modifications to applications and the System Folder. When a program (virus or otherwise) tries to modify an application or system file or attempts to add a new extension to the System Folder, a warning appears that lets you prohibit or permit the operation. Similar warnings can appear when you're installing a new program. (You can also tell SAM to automatically allow a specific type of modification, to eliminate unnecessary warnings.)

As for the free and shareware virus-detection utilities, the most popular are John Norstad's Disinfectant (a detection and repair application with a watchdog extension), Jeffery S. Shulman's VirusDetective (a detection and repair DA), VirusBlockade (a watchdog extension), and Chris Johnson's Gatekeeper and Gatekeeper Aid.

At least one virus-detection utility belongs in every Macintosh user's software library. Start with the programs I just mentioned — they're free, and they may be all you need. For extra protection, consider one of the commercial packages.

Protection for the paranoid

If security is extremely important, you may also consider Casady & Greene's AME. Short for Access Managed Environment, AME provides more security than you'll find at a Secret Service company picnic. You can create a list of people permitted to use your Mac, and then define privileges — such as the ability to create or delete files, use printers, or insert floppy disks. For virus protection, you can register your healthy applications as "trusted," and then instruct AME to compare an application to its registration to verify that it hasn't been altered. If it has, AME won't permit it to run.

QUICK TIPS

One Watchdog is Enough

It's worth noting that watchdog extensions can cause problems if you're not careful. SAM's Intercept INIT, for example, lets you intercept certain activities that some programs perform as part of their normal operation. SAM includes a list of over a dozen software and hardware products that Intercept may not work with properly — one of them is the Virex INIT. With virus utilities, two watchdogs do not necessarily offer twice the protection of one.

No Sure Cures

As I mentioned earlier, a virus-detection utility can't guarantee immunity. It's possible for a new virus to bypass a utility's detection and prevention features. When a new virus appears, a detection utility must be revised to recognize it. Many of the today's packages enable you to update the program yourself by typing cryptic character sequences that the utility looks for as it scans for viruses. But the virus has to be discovered before the utility's developer can tell its customers which characters to type.

Your other alternative is to buy individual program updates (often $15 to $25) or subscribe to a series of updates (usually $50 to $75). If a few new viruses appear each year, you'll spend a small sum keeping your medicine cabinet up to date — and you'll be partially unprotected until the latest versions arrive.

Some people believe virus-detection utilities challenge virus writers to create new strains that can bypass their protection measures. They may be right; the WDEF virus contained a stealth mechanism that enabled it to evade most detection utilities when it first appeared.

What Are My Chances Doc?

How likely are you to get a virus? In a *Macworld* reader survey that ran several years ago, only about eight percent of the readers who responded had been infected. I've never had a virus, and I hang out on a half-dozen information services and run untested shareware with abandon. (Fortunately, all commercial on-line services such as America Online and CompuServe scan uploaded files for viruses before making them available for downloading.) OK, I'm a hypocrite — a doctor who tells you to watch your diet while his own cheeks bulge with M&Ms.

Or maybe I simply give viruses the attention they deserve. The virus threat is minimal; you'll probably never see one. But they are out there, and new ones can appear at any time.

Coming to Terms with SCSI

The Mac's SCSI bus certainly doesn't represent the danger that viruses do, and yet SCSI problems are far more common than virus infections. Indeed, some types of SCSI problems have symptoms that are similar to those of a virus infection — slow performance, system crashes, and lost files. To be able to differentiate between a virus infection and a SCSI problem, it helps to understand what SCSI is, how it works, and what kinds of problems it can create.

A Brief History of SCSI

Any computer can benefit from the speed and capacity of a hard disk, yet the Macintosh entered the world barely able to communicate with one. The Mac that Steve Jobs unveiled in 1984 lacked a connector for attaching hard drives. Most of the pioneering hard drives that were available attached to the Mac's modem port, which was far too slow to handle the speeds the hard drives were capable of. It wasn't a bottleneck, it was the skinny part of an hourglass.

The Mac languished until early 1986, when Apple introduced the Mac Plus. Besides offering faster performance and more memory, the Plus introduced a new rear-panel connector designed specifically for hard drives and other fast add-ons. This new connector used a high-speed communications scheme called the *Small Computer Systems Interface,* or *SCSI* for short. SCSI saved the Mac by enabling it to communicate with high-speed peripherals at a reasonable speed. Hard drives, image scanners, personal laser printers, CD-ROM drives, tape backup devices, SyQuest and Bernoulli cartridge drives — none of these add-ons would be as popular as they are today without SCSI.

That's the sweet side of SCSI. There's also a bitter side, and it surfaces when you connect several SCSI devices to a Mac — and are suddenly unable to start it. What follows is often a bad dream filled with cable juggling, switch flicking, and head scratching. There's a quirkiness to SCSI, and it's no wonder the acronym is usually pronounced as a word: *scuzzy.*

In this section, I'll explore the bittersweet world of SCSI and pass along some survival tips. I'll also spotlight some recent developments in the SCSI field that promise to deliver fewer headaches and even faster performance.

Public Data Transportation

In computer terms, SCSI is a *bus* — a set of common wires upon which data and instructions flow. A Mac contains several buses. Some enable information to move between the Mac's memory and other internal components; others are designed to enable you to attach additional hardware to the Mac. The SCSI bus falls into the latter category, as do the various internal expansion slots present in most desktop Macs.

But expansion slots are inside the case. The SCSI connector is on the outside so it can attach to external devices. In this regard, SCSI is similar to another bus: the *Apple Desktop Bus* (ADB), which is the connection scheme the Mac's keyboard and mouse use. (Every Mac from the SE on also has an internal SCSI connector that attaches to an internal hard disk.)

SCSI strengths

The Mac's SCSI port has two basic strengths. First, it's fast. A Mac Classic's SCSI bus can transfer up to roughly 650,000 characters (650K) per second; a Quadra 900's SCSI bus can shuttle up to five million characters (5MB) per second. One reason SCSI is speedy is because it transfers the eight bits that comprise a byte in *parallel:* The bits travel alongside each other, each in its own wire, like parade marchers striding eight abreast. By contrast, the Mac's slower modem, printer, and ADB ports transfer data in *serial* fashion: Bits must travel single-file, one after another, like shoppers passing through a check-out line.

But whether data actually travels as quickly as the SCSI bus can carry it depends on the device that you attach to the Mac: A German freeway may have a speed limit of 100 miles per hour, but not every car can sustain that pace. If you connect a hard drive that delivers "only" a megabyte per second to a Quadra, you aren't taking full advantage of the Quadra's SCSI capabilities. The lesson: If you're buying a hard drive, look for one that can keep up with your Mac. But don't overbuy: If you attach a 1MB per second hard drive to the slower SCSI port on a Classic, you won't fully exploit the drive.

The SCSI port's other strength is that it can accommodate up to seven devices. How can seven devices connect to one port? Through a technique called *daisy chaining:* You connect one device to the Mac, and then connect other devices to each other. Almost every SCSI add-on has two SCSI connectors on its back panel: One connector accepts the cable that attaches to the Mac, and the other accepts the cable that attaches to the next device in the chain. (If you have a device with only one SCSI connector — such as a GCC Technologies PLP laser printer — that device must be the last device on the SCSI chain.)

Tip: Before making any SCSI connections, turn *off* your Mac and any external SCSI devices attached to it. Changing any SCSI connection when a device is on is asking for sizzled circuits.

SCSI's speed and ability to accommodate numerous external devices help explain why Apple adopted the bus back in 1986: It enabled the company to introduce an expandable Mac without having to design a new case and add costly expansion slots. But as you'll see, its versatility is also responsible for the scuzzier aspects of SCSI.

SCSI addressing

If one SCSI port can accommodate several add-ons, how does a device know when information coming from the Mac is intended for it? What keeps a hard drive from responding to commands for a scanner, and vice versa?

SCSI *addresses,* also called *ID numbers,* give every device attached to a SCSI port its own electronic house number. When the Mac transmits information to a device, it sends the device's address along with the information. All the devices on the SCSI chain — including the Mac — constantly monitor the bus for activity, but only the device the information is addressed to responds. The first device to transmit a signal gets control of the SCSI bus — just as the first person in a house who picks up the phone gets control of the line.

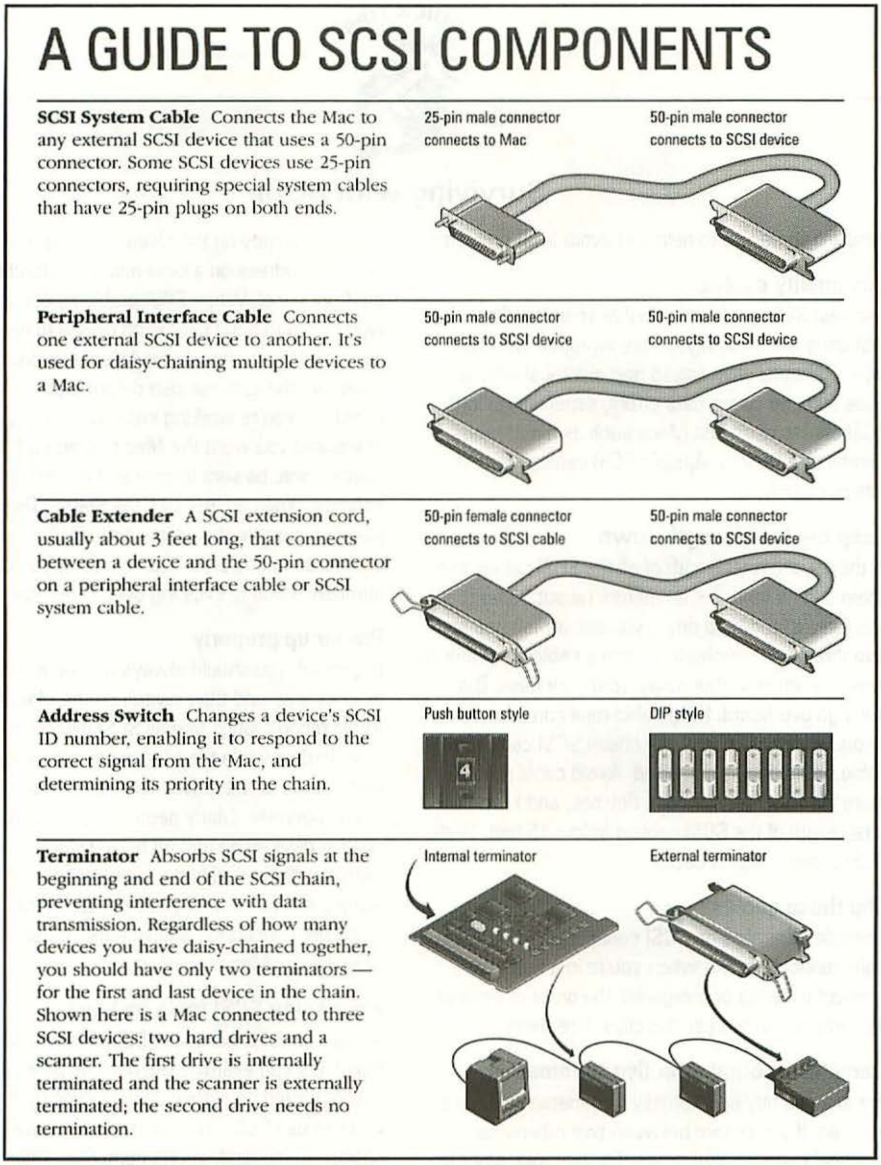
And if two devices transmit a signal at the same time? The SCSI ID helps there, too, by assigning priority to each device. On the SCSI totem pole, the higher a device's address, the higher the device's priority. If, say, a hard drive and a scanner both try to access the bus at the same time, the device with the higher address number wins. This is called *bus arbitration.*

SCSI address numbers run from 0 through 6. The Mac itself has an address of 7. If your Mac contains a hard drive, the hard drive's address is always 0. If your Mac has an internal CD-ROM drive, the CD-ROM drive's address is always 3. External SCSI devices such as hard drives and scanners have rear-panel switches that let you change their IDs (see Figure 27-6 "A Guide to SCSI Components").

Two houses can't have the same address, nor can two SCSI devices. If you connect a device whose ID matches that of a device already on the chain, disk errors may occur or the Mac may not start up at all. When that happens, shut everything off and follow the advice in the Quick Tips box "Surviving with SCSI."

SCSI meets the terminator

For the Mac to know where the SCSI bus begins and ends, the bus needs small electronic components called *terminators.* Terminators are the bumpers on the front and back of the SCSI bus: They absorb colliding SCSI signals, preventing them from electrically reflecting within the cabling and interfering with reliable data transmission. If you attach more than one SCSI device to a Mac, you'll also need to grapple with terminators. Improper termination is another common source of SCSI woes.



A GUIDE TO SCSI COMPONENTS

SCSI System Cable Connects the Mac to any external SCSI device that uses a 50-pin connector. Some SCSI devices use 25-pin connectors, requiring special system cables that have 25-pin plugs on both ends.

25-pin male connector connects to Mac
50-pin male connector connects to SCSI device

Peripheral Interface Cable Connects one external SCSI device to another. It's used for daisy-chaining multiple devices to a Mac.

50-pin male connector connects to SCSI device
50-pin male connector connects to SCSI device

Cable Extender A SCSI extension cord, usually about 3 feet long, that connects between a device and the 50-pin connector on a peripheral interface cable or SCSI system cable.

50-pin female connector connects to SCSI cable
50-pin male connector connects to SCSI device

Address Switch Changes a device's SCSI ID number, enabling it to respond to the correct signal from the Mac, and determining its priority in the chain.

Terminator Absorbs SCSI signals at the beginning and end of the SCSI chain, preventing interference with data transmission. Regardless of how many devices you have daisy-chained together, you should have only two terminators — for the first and last device in the chain. Shown here is a Mac connected to three SCSI devices: two hard drives and a scanner. The first drive is internally terminated and the scanner is externally terminated; the second drive needs no termination.

Figure 27-6: A Guide to SCSI Components

Surviving with SCSI

Here are some tips to help you avoid SCSI problems.

Buy quality cables

The best SCSI cables are *double-shielded:* The wires that carry the SCSI signals are wrapped with two layers of metal shielding to trap electrical interference that can cause data errors, especially in long SCSI chains or on fast Macs such as a mid-range Centris or a Quadra. Apple's SCSI cables are first-rate but costly.

Keep the cable length down

In theory, the total length of all the SCSI cables in a chain can be up to seven meters (about 23 feet). If you have a loud hard drive, you can attach one or two three-foot peripheral interface cables together to move the drive further away from your desk. But don't go overboard. Long cable runs can cause data errors, especially if you use cheap SCSI cables or if a cable's shielding is damaged. Avoid cable runs of more than six feet between devices, and keep the total length of the SCSI cabling below 15 feet. With SCSI cabling, less is better.

Clip those cables

The little wire clips on SCSI connectors help ensure a tight connection. But when you're in a hurry to connect a device or reorganize the order of devices, it's tempting to not use the clips. Use them.

Demand external or active termination

Try to avoid buying internally terminated devices if you can. If you're torn between two otherwise identical external hard drives, for example, buy the one that is not internally terminated. You'll have one less device to worry about in future termination travails.

Check those addresses

Before installing a new device, examine its SCSI address switch and make sure it won't conflict with a device already on the chain. Consider writing a device's address on a label and then attaching it to the front panel. When SCSI problems occur, you won't have to bend over each device to determine its address. When changing a device's address, keep in mind that the address also determines the device's priority. If you're working with two external hard drives and you want the Mac to start up from a specific one, be sure to give that drive the higher address. (You can also use the Startup Disk control panel to override this start-up order.) You can assign addresses in any order: For example, you can use ID numbers 3 and 5, skipping over ID number 4.

Power up properly

In general, you should always turn on external SCSI devices first, and then switch on the Mac. Also, Apple recommends that all SCSI devices be switched on while the Mac is on, even if you aren't using some of them. Neither rule seems carved in stone, however. Many people (myself included) turn all their devices on and off from a single power switch without problems. I usually have no trouble leaving one or more devices off, too, although now and then, I encounter a device that must be on in order for the Mac to start up.

Keep some SCSI tools on hand

A free control panel called SCSI Probe (by Robert Polic) lets you examine the devices on a bus and If you've turned on a drive after starting up the Mac, you can use SCSI Probe to make the drive's icon appear on the desktop. (In computer lingo, this is called *mounting* the drive.) FWB's terrific Hard Disk Toolkit contains a similar control panel. Hard Disk Toolkit also lets you test a hard drive and fine-tune it for best performance.

Internal and external termination

As Figure 27-6 shows, terminators can be internal or external. Internal terminators are usually installed directly on a device's circuit board; external terminators attach to a device's rear-panel SCSI connector. Some devices also provide convenient termination switches that let you activate or deactivate internal termination.

In theory, termination is simple: Two's company, and three's a crowd. Specifically, the first and last device in the SCSI chain must each have a terminator connected to it. If your Mac contains an internal hard drive, the drive has an internal terminator. If you have one external SCSI device attached, it needs a terminator, too. If you have two or more external SCSI devices, those in between the first and last device must *not* be terminated. Having more than two terminators on the SCSI bus can cause start-up problems, data errors, and even hardware damage.

Tip: The Mac IIfx uses special SCSI circuitry that requires nonstandard terminators, which usually have black plastic cases instead of the common gray ones. Be sure to use only the black, IIfx-style terminators with this Mac.

POWERBOOK ANGLE

SCSI and PowerBooks

PowerBooks have the same basic SCSI advantages and potential problems as desk-bound Macs. This box describes some PowerBook particulars that relate to SCSI.

The SCSI disk mode

The PowerBook 100, 160, and 180, as well as the Duo models, offer a unique *SCSI disk mode* that enables you to attach the PowerBook to another Mac's SCSI port as though it were an external hard drive. Once connected, the PowerBook hard drive appears on the other Mac's desktop. It's an ideal way to transfer files created on the road.

To connect a PowerBook to another Mac via SCSI, use an HDI-30 SCSI Disk Adapter Cable (Apple part number M2539LL/A). Connect the Disk Adapter Cable to a SCSI System Cable. Depending on the Mac you're connecting to, you may also need one or more SCSI terminators; check your PowerBook's manual for details.

Cable considerations

All PowerBook models (as well as the Duo Dock) do not use the 25-pin SCSI connector other Macs provide, but instead use a smaller connector called an HDI-30. To connect a PowerBook to a SCSI device, use Apple's Apple HDI-30 SCSI System Cable (part number M2538LL/A). You'll probably need to also use a Peripheral Interface Cable, because the HDI-30 SCSI System Cable is only 18 inches long.

Determining termination

How do you know whether your new SCSI gizmo is internally terminated? It isn't always easy to tell, which is why Apple recommends that hardware manufacturers not use internal terminators in external devices. (An external terminator is easy to spot: It's dangling off the back of the box.) Still, some companies use internal termination, perhaps because including an external terminator would add expense. Generally, a device's manual should state whether it's internally terminated, although hard drive vendors have been known to contradict their own manuals.

All This and SCSI-2

A Quadra's 5MB-per-second transfer rate sounds (and is) fast, but SCSI isn't stopping there. A new version of the SCSI specification, *SCSI-2,* promises data transfer rates of 10MB to 40MB per second — essential speeds for high-end color applications, where 100MB files aren't uncommon. The key performance-enhancing aspects of SCSI-2 are *Fast SCSI* and *Wide SCSI.* Fast SCSI doubles the bus's transfer rate to 10MB. Wide SCSI adds lanes to the bus's freeway, expanding SCSI's parallel data path from eight bits wide to 16 and eventually 32 bits.

A few high-end hard drives are available that support fast and wide SCSI. But to exploit them with any other than a high-end Mac, you need a SCSI-2 adapter card such as MicroNet's NuPort II, Storage Dimensions' Data Cannon series, or PLI's QuickSCSI. These plug into a NuBus slot of any Mac II or into the processor-direct slot of a Quadra or IIfx, and provide a SCSI-2 port. A SCSI accelerator can make a slower Mac such as a IIcx or IIci transfer data like a Quadra, and can boost a Quadra's rates even higher.

Keep in mind only a few costly high-capacity hard drives can approach the transfer rates these boards are capable of. As a rule, the lower your hard drive's capacity, the less likely it is to benefit from a SCSI accelerator.

Special SCSI-2 considerations

But the advent of SCSI-2 may create the potential for even more SCSI headaches. SCSI-2's fast transfer rates make high-quality cables and correct termination more essential than ever. Moving up to SCSI-2 also means becoming familiar with new cabling and termination schemes. There isn't room on the back of a SCSI-2 adapter card for the conventional 50-pin Centronics-style connectors you're probably used to working with. Instead, fast SCSI-2 cards use a high-density 50-pin connector, called an HD-50, whose smaller pins are packed together like rush-hour bus riders.

Take care when attaching the cable's connector to the card; the weight of the cable and the force required to mate the connectors can loosen the card — a scenario for disaster. You may want to connect the cable while the Mac's case lid is still removed, using one hand to steady the card as you make the connection. (And speaking of cables, buy only double-shielded, twisted-pair SCSI cables for any fast hard drive: Bargain-basement cables are likely to cause data errors and reduced performance.)

Wide SCSI-2 adapters and drives use yet another type of connector, which has 68 pins. Wide SCSI-2 devices also provide *active termination* features, in which circuitry within the drive automatically terminates the SCSI bus — no futzing with terminators. A growing number of vendors are providing active termination in standard SCSI devices.

The evolving bus

SCSI is also evolving within the Mac family. The Quadra 900 and 950 contain two electrically separate SCSI buses. Some disk arrays take advantage of the two buses; one of the drives in the array connects to the Quadra's external bus while the other attaches to the internal bus. Specialized driver software separates the two buses and allows data striping across the two mechanisms.

Speaking of driver software, in mid-1993 Apple released a new version of the SCSI Manager — the portion of the Mac's system software that deals with SCSI devices. The new SCSI Manager supports the SCSI-2 command set as well as more sophisticated data-transfer and SCSI communications techniques. For example, the new manager supports *disconnect/reconnect*, which enables a device to electronically disconnect and release control of the SCSI bus while processing a command from the Mac and then reconnect when it's again ready to communicate with the Mac. This enables the Mac to submit data requests to multiple devices so that those requests are executed in parallel — ideal for disk arrays.

The new manager also supports *asynchronous* SCSI communications. This enables the Mac's central processor to initiate a SCSI data transfer operation and then go on to other tasks while the transfer takes place.

The improved SCSI Manager also takes advantage of the *direct-memory access* (DMA) chips present in some Mac models, including the IIfx, Centris 660AV, and Quadra 840AV. DMA support enables these Macs to perform other jobs while data is transferred to or from a SCSI device. The SCSI Manager also takes full advantage of the two SCSI buses present in many Quadra models to enable you to connect up to 14 devices.

In short, SCSI remains as useful to the Mac family today as it was in 1986. It's the bus that saved the Mac, helped lower the cost of hard drives, and still enables even low-end Macs to tap into a variety of powerful add-ons. Some occasional scuzziness is a small price to pay for all that.

CHAPTER 27 CONCEPTS AND TERMS

- Because they can store thousands of files, hard disks are more difficult to back up than floppy disks.
- A full backup is a backup of all the files on a hard drive; an incremental backup copies only those files you've added or changed since the last full backup.
- Points to consider when shopping for a backup utility include network support (if you use AppleShare or System 7 file sharing); backup selectivity (the ability to exclude certain files, such as applications and system files, from a backup routine); and the method used to store backup files (Finder-readable backups versus backups that must be restored using the utility itself).
- Viruses are tools of vandalism created by twisted programmers. Malicious viruses can damage your system software, applications, and documents. Mischievous viruses may simply display a message on the screen, but can still be dangerous due to sloppy programming.
- Although the virus threat is real, your chances of being victimized by one are small, especially if your Mac isn't on a network and you don't swap software or disks with other users.
- Generally, the more Macs your machine comes into contact with, the greater the risk of infection.
- To help guard against infection, lock floppy disks whenever possible (viruses can't infect locked disks); back up regularly; run a new free or shareware program from a floppy disk; and use one or more virus-detection utilities to scan for and guard against infections (don't combine utilities indiscriminately, however).
- The Mac's SCSI bus is a versatile connection scheme for hard drives and other performance-oriented add-ons, but it can also be the source of headaches.
- Common SCSI problems include incorrect termination, duplicated SCSI ID addresses, and data-transfer errors caused by cheap or faulty cabling.
- SCSI-2 is an enhanced version of the SCSI standard that allows for faster data transfers.

active termination
A SCSI termination scheme, provided by Wide SCSI-2 devices and some conventional SCSI devices, in which circuitry within the drive automatically terminates the SCSI bus — no futzing with terminators.

address
Also called an *ID number,* a unique electronic house number that every device attached to a SCSI port must have. When the Mac transmits information to a device, it sends the device's address along with the information.

asynchronous transfers
An advanced SCSI-2 data-transfer technique that enables the Mac to initiate a SCSI data transfer operation and then go on to other tasks while the transfer takes place.

backup utility
A program that stores copies of your files on floppy disks or other storage devices.

daisy chaining
A device connection technique, used by SCSI, in which you attach one device to the Mac, and then connect other devices to each other.

disconnect/reconnect
An advanced SCSI-2 data-transfer technique that enables a device to electronically disconnect and release control of the SCSI bus while processing a command from the Mac and then reconnect when it's again ready to communicate with the Mac.

disk editors
Utility programs that let you directly view and alter a disk's contents, including disk areas that are normally inaccessible.

file-recovery utility
A program that can resurrect damaged files as well as files that you threw away by mistake.

full backup
A backup session that copies all files located on a given drive.

incremental backup
A backup session that copies only those files you've added or changed since the last full backup.

parallel
A data-transmission technique in which bits travel alongside each other, each in its own wire, like parade marchers striding eight abreast. The Mac's SCSI bus transfers data in parallel. Compare with *serial.*

restore
The process of copying files from backup media such as floppy disks to the hard drive.

SCSI disk mode
A SCSI feature offered by some PowerBook models that enables you to attach the PowerBook to another Mac's SCSI port as though it were an external hard drive. Once connected, the PowerBook hard drive appears on the other Mac's desktop.

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serial
A data-transmission technique in which bits travel single-file, one after another, like shoppers passing through a checkout line. The Mac's modem, printer, and ADB ports transfer data in serial fashion. Compare with *parallel.*

terminator
An electronic component that tells the Mac where a SCSI bus begins and ends. Terminators are the bumpers on the front and back of the SCSI bus: They absorb colliding SCSI signals, preventing them from electrically reflecting within the cabling and interfering with reliable data transmission.

Trojan horse
A program that appears to be legitimate, but which damages or erases files or installs a virus when you run it.

verify option
A backup utility option that, when active, causes a program to proofread its work as it backs up files. If a disk error causes a file to be written inaccurately, the verification process catches it, and the utility tries again.

viruses
Programs that invade the Mac and slow its performance, cause system errors, or destroy applications and documents. A virus contains software instructions that enable it to copy itself into legitimate files, called *hosts.*

watchdog extension
A system extension that can help prevent virus infections by prohibiting certain types of activities that a virus is likely to perform — such as modifying the System file.

CHAPTER TWENTY-EIGHT

Exchanging Data

IN THIS CHAPTER

- Exchanging files between programs and computers
- Understanding Clipboard formats
- Comparing interchange file formats
- Creating hot links with System 7 publish and subscribe and Microsoft OLE
- Converting files between Macs and DOS PCs
- Exchanging documents with Adobe Acrobat

Remember the videotape format wars of the eighties — Beta versus VHS? You couldn't play one type of tape in the other type of machine, and until Beta died its slow death, video stores stocked both formats.

Before that, the standards battle was between the 8-track tape and the cassette. Before that, it was long-playing records versus fast-spinning 78s. And in the last century, railroads had a hard time agreeing on how much distance there should be between the tracks. As the industry joke goes, the great thing about standards is that there are so many to choose from.

In the Mac world, this lack of standards hits home as you start using more and more application programs and find that you need to move information between them. Maybe you want to include a scanned image in a document you've created with a publishing program. Or you want to move a database file created with Microsoft Works on a PowerBook to your desktop Mac, which is running FileMaker Pro. Or perhaps a client gave you a WordPerfect file, but you use Microsoft Word.

In each of these cases, you need to contend with *file formats* — the way a particular program stores information when you use the Save command. In this chapter, I examine some of the technical issues behind exchanging data with disk files, with the Clipboard, and with System 7's publish and subscribe features. I also show how to use the file-conversion features many popular programs provide, and I spotlight some programs that can convert files from one format to another.

The Format of Things

ON THE CD

- Adobe Acrobat PDF file
- GraphicConverter (in The Best of BMUG)

Ideally, you should be able to use one program to open another program's documents without thinking about file formats — just as you can play a compact disc using any brand of CD player.

The complex nature of application programs makes this ideal world impossible, at least for now. Each category of program works with information in a different way, and each has its own information-storage requirements. A word processor needs to store long strings of text characters as well as formatting information — fonts and type sizes, headers and footers, page numbers, and margins. A spreadsheet program needs to store the numbers and formulas you enter as well as column-width and text-formatting information. A publishing program must store formatted text and graphics as well as layout-related details such as the location of ruler guides. A database manager needs to store the data you enter and also the data-entry screens and reports you design.

You can see the common thread here: Programs must store not only what you type with the keyboard and draw with the mouse, but also the formatting codes necessary to re-create a document's appearance on the screen and on the printed page.

Import/export restrictions

A program's own file format is often called its *native* format. For example, Microsoft Word's native files are Word documents, and QuarkXPress's native files are QuarkXPress publications. A non-native file is often called a *foreign* file. To Microsoft Word, for example, a WordPerfect document is a foreign file. The process of saving a file in a non-native format is called *exporting*. And as you may guess, bringing data in from a different program is called *importing*.

Many programs are capable of opening and saving files in competing programs' native formats. Among word processors, for example, Microsoft Word can open and save WordPerfect documents, and vice versa. Among spreadsheet programs, Microsoft Excel can open and save Lotus 1-2-3 documents, and vice versa.

But there can be flies in the ointment. A document's formatting can change when being imported or exported because one program may not support all the features of the other. Even worse things can happen: For example, if you try to use WordPerfect to open a Microsoft Word document saved using Word's fast-save option, WordPerfect crashes. The solution: Disable Word's fast-save option using the Open and Save option of Word's Preferences dialog box.

Figure 28-1 "File Conversion Roadmap" maps out the basic steps you must take to determine how to get foreign files into a format you and your Mac can understand.

Filters for files

More and more software firms are creating programs whose file-conversion features can be expanded through the use of conversion filters, also called converters or translators. A filter is a small file that tells a program how to convert a particular

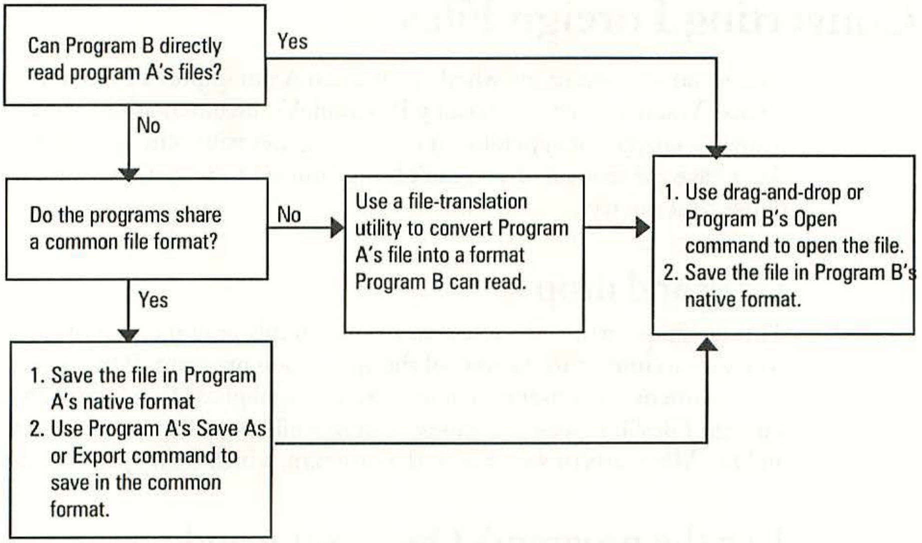

Can Program B directly read program A's files?
Yes
No
Do the programs share a common file format?
No
Use a file-translation utility to convert Program A's file into a format Program B can read.
1. Use drag-and-drop or Program B's Open command to open the file.
2. Save the file in Program B's native format.
Yes
1. Save the file in Program A's native format
2. Use Program A's Save As or Export command to save in the common format.

Figure 28-1: File Conversion Roadmap Taking a data-exchange trip? Use this roadmap as a guide to choosing the best approach.

type of foreign file. Filters usually reside within a specific folder on your hard drive; when you start a program, it determines which filters are present and then adjusts its Open and Save dialog boxes to reflect those conversion options.

The filter approach has its advantages. You can save disk space by deleting unneeded filters or by not installing them to begin with. Better still, you can add additional filters as they become available; many developers make new filters available for downloading through on-line services such as America Online and CompuServe. (For details on downloading software from on-line services, see Chapter 18.)

Just a few of the programs that use conversion filters include Microsoft Word, Aldus PageMaker, QuarkXPress, WordPerfect, WordStar's WriteNow, and Claris' MacDraw Pro, ClarisWorks, MacWrite II, and MacWrite Pro. The last six programs use a file-translation technology called *XTND.* Originally developed by Claris and now under Apple's wing, XTND establishes a standard design for filters, so that any filter designed for XTND can be used with any program that supports XTND. This standardization also makes it possible for companies to sell libraries of file translators that work with any XTND-compatible program. DataViz's MacLink Plus/Translators is one such package, offering over 150 translators.

Converting Foreign Files

So how do you determine whether Program A can import Program B's documents? You may start by checking Program A's documentation: Most manuals contain a chapter or appendix on exchanging files with other programs. If you don't have the manual or you can't bring yourself to read it, there are two techniques you can try.

Drag and drop

This technique works with System 7 only. Simply drag the icon of the document you want to import to the icon of the application program. If the program can open the document, the program's icon becomes highlighted (see Figure 28-2 "Opening Foreign Files"). Release the mouse button while the program's icon is highlighted, and the Mac starts or switches to the program, which then opens the document.

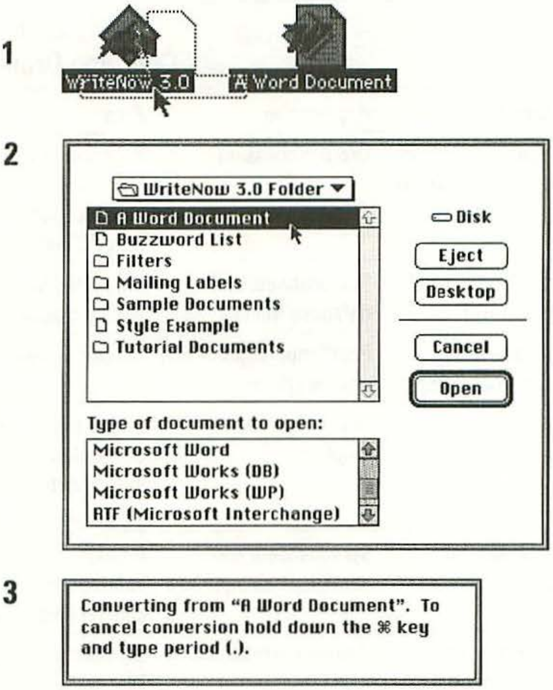
Use the program's Open command

Because the Finder doesn't know which import filters you may have installed, this technique is more reliable than the previous one. Start the program you want to use to open the document, choose Open from the File menu, and then navigate your way to the folder containing the document. If the program is able to open the document, its name appears in the Open dialog box. (In many programs, you can narrow down the list of files displayed by choosing the type of file you're looking for from a pop-up menu in the Open dialog box.) When you double-click the document, you'll probably see a message saying the program is converting a foreign file.

After the import

When a program imports a file, that file's contents usually appear in a new, untitled window. When you choose the Save command, you will need to supply a name for the document. Don't type the same name as the original foreign file unless you really want to replace it. It's better to use a different name, one that reflects the fact that you've converted the file. For example, if you used Word to open a foreign file named Business Plan, you might name the new file Business Plan/Word.

Desktop publishing programs put a different spin on the import-export routine. In Aldus PageMaker, instead of using the Open command to import a document, you use the Place command. In QuarkXPress, you use the Get Text or Get Picture command. With both programs, an imported file doesn't appear in a new, untitled



Converting from "A Word Document". To cancel conversion hold down the ⌘ key and type period (.).

Figure 28-2: Opening Foreign Files With System 7, one way to open a foreign file is to drag its icon to that of the program. When the program's icon becomes highlighted (1), release the mouse button. Here, a Word document is being dragged to the icon of WordStar's WriteNow. A more-reliable technique is to start the program and then choose its Open command (2). When you open a foreign file, most programs display a conversion dialog box similar to this one (3).

window, but in the currently active publication window. Both PageMaker and QuarkXPress include filters for a large variety of file formats — any publishing program must, because one of its chief roles is to enable you to combine text and graphics created in other programs.

Interchange Formats

If one program can't directly read another program's documents, you need to find a file format that both programs do support. This parcel of common ground is often an *interchange* file format — a file format designed for moving data between programs.

Table 28-1 summarizes the most common interchange file formats in the Macintosh world.

Table 28-1
Common Ground

Format	*Application*	*Pros*	*Cons*
Document Content Architecture (DCA)	Word processing	Supported by many IBM PC programs and IBM word processors, and by MacLink Plus/PC and Apple File Exchange	Font, style, and size information are lost
Data Interchange Format (DIF)	Spreadsheets and database management	Supported by many programs and by MacLink Plus/PC	Cell formatting and widths are lost
Encapsulated PostScript (EPS)	PostScript graphics and special effects	Supported by many DOS PC programs	Applies to PostScript devices only
PICT	Object-oriented graphics	Supported by the DOS PC version of PageMaker; translators available for converting to Microsoft Windows graphics	Minimal DOS PC support
Symbolic Link (SYLK)	Spreadsheets and database management	Retains some formatting information, including commas, column widths, and cell alignment	Font, style, and size information is lost
Tagged-Image File Format (TIFF)	Bitmapped graphics	Supported by many IBM PC and Macintosh scanners; not tied to specific computer or graphics resolution	Files can be large and time-consuming to load
Rich-Text Format (RTF)	Word processing	Retains most formatting information, including font, styles, and sizes; supported by Mac and Windows versions of PageMaker and QuarkXPress	Not supported by some Mac word processors

Word processor formats

For word processor documents, the best interchange file format is the *rich-text format*, or *RTF*. This format, developed by Microsoft, is supported by Microsoft Word as well as WriteNow, WordPerfect, Aldus PageMaker, and others. RTF files retain all text formatting and even graphics. The least desirable interchange format is the *text-only* file, which discards nearly all formatting information.

Nothing but the text

Standards are rare in computing, but there is one that enables you to exchange data between any two programs — and for that matter, any two computers. It's the American Standard Code for Information Interchange — ASCII, for short — and it's the least common denominator in the world of data exchange.

ASCII (pronounced *ask-ee*) is a set of 256 codes, each representing a letter, number, special character, or a control code (a rudimentary formatting function such as a tab or carriage return). All computers use the ASCII character set, and thus, can exchange text and rudimentary formatting (tabs and carriage returns). Among the wonders that ASCII makes possible are text-oriented on-line services such as CompuServe, which can be accessed using any computer equipped with a modem.

Most programs that deal with text can save and open files containing only ASCII codes. In the Mac world, such ASCII files are called *text-only* files. By saving a document as a text-only file, you lose its formatting information, but at least you can transfer its text to another program.

Making a text-only file

To save a document as a text-only file, first be sure you've saved the document in its native file format. Next, choose the application's Save As command and select the text-only option (see Figure 28-3 "How to Make Text Only"). Give the text-only file a different filename to avoid replacing the original. Avoid editing at this point, because any changes you make won't be saved in the original, formatted document. For this reason, it's best to create a text-only file only when you're ready to open the file with the importing application.

Some word processors make you perform an extra step when saving text-only files. After you confirm the Save As dialog box, they ask if a carriage return should be put at the end of each line or only between paragraphs. If you plan to open the document with a word processor or publishing program, choose Paragraphs. Choosing Line Breaks tells the program to place a carriage return at each line ending. All those extra returns defeat the importing program's word wrap feature, making reformatting difficult.

Opening a text-only file

The steps required to open a text-only file in the importing application depend on the program. With most word processors and spreadsheets, simply use the Open command. If you haven't yet started the program, you can use the drag-and-drop technique described earlier in this chapter.

With publishing programs, you usually import text-only files using a Place or Get Text command. Most programs assign preset font, style, and size values to unformatted ASCII text, so you may want to adjust those presets before opening the file. Check the formatting and file-importing sections of your program's manual for details on such features.

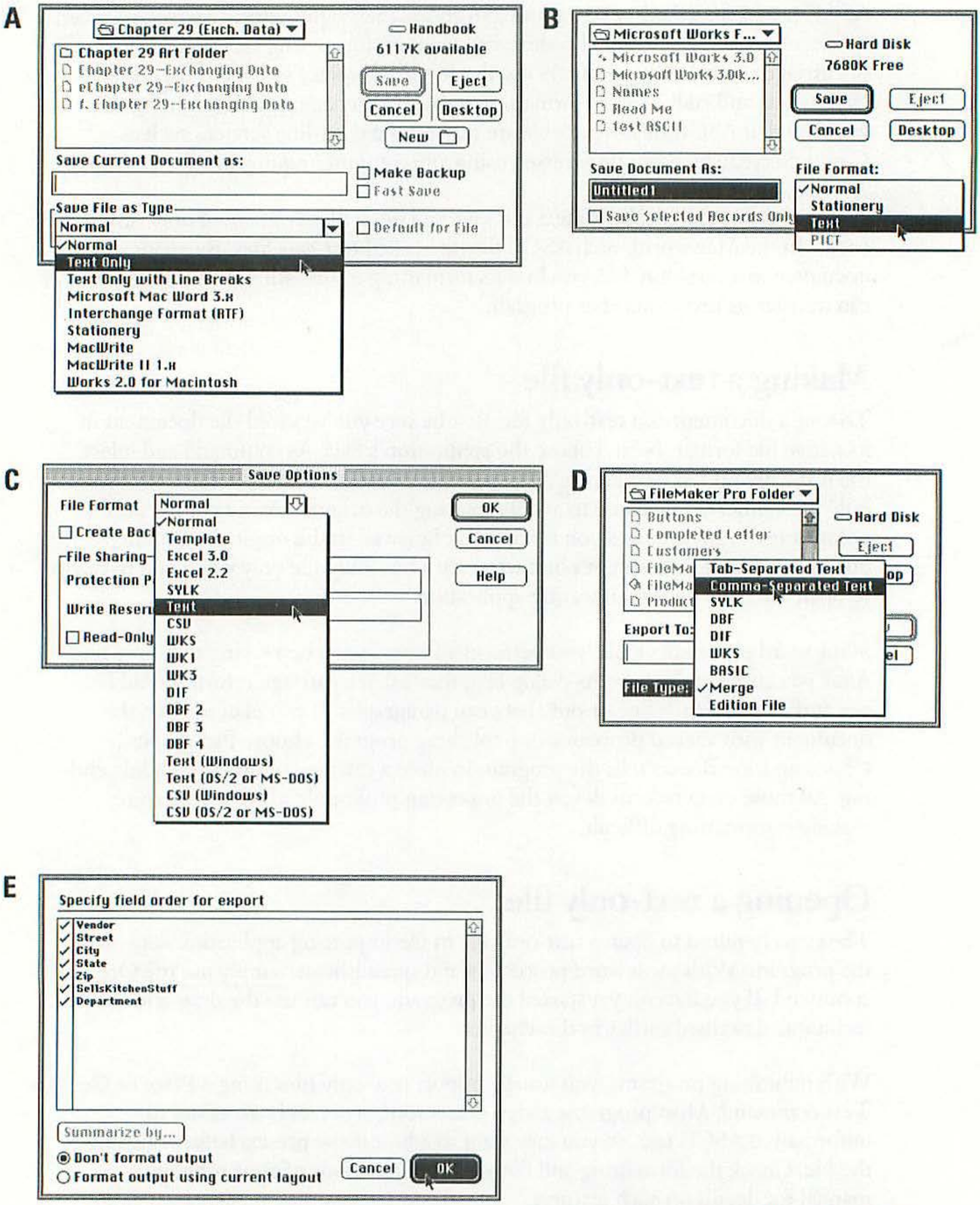


Figure 28-3: How to Make Text Only Most Mac applications let you save documents in ASCII, or text-only, form. With Microsoft Word (A), choose Save As, and then choose the desired format from the pop-up menu. With Microsoft Works (B), choose Save As and choose the Text format. With Excel (C), choose Save As, and then click the Options button and choose Text. With FileMaker Pro (D), choose Export Records from the Import/Export submenu (in the File menu), and then choose the desired format from the pop-up menu. Next, select the fields to be exported (E) and then click OK.

Spreadsheet and database exchange formats

For swapping spreadsheets and databases, a common interchange format is the *symbolic link*, or *SYLK*, file. If you save a spreadsheet as a SYLK file, you will lose font, style, and size information, but you will save rudimentary formatting such as column widths and cell alignment. All popular spreadsheet and database programs can open and save SYLK files. You can also exchange databases through text-only files, although you'll lose all formatting.

If you need to exchange a spreadsheet or a database file, use the exporting program's Save As or Export command to create a file in a format the importing program can interpret. If both programs support an exchange format such as SYLK, use it. Advanced data managers such as ACI's 4th Dimension and Microsoft's FoxBASE+/Mac offer many ways to exchange data. You can, for example, often import data from and export it to ASCII files directly, or you can use a *print-to-disk* option to create an ASCII file containing those records that appear in a given report.

Delimiters — boundaries for bytes

If you must resort to the lowly ASCII file, you'll encounter an additional data-exchange wrinkle. In order to separate the rows and columns of a spreadsheet or the fields and records of a database, the program must insert codes called delimiters. As I described in Chapter 8, delimiters are boundaries that they tell the importing program where one field or cell ends and the next begins.

The most common field or cell delimiter is a tab character (ASCII code 9); the most common row or record delimiter is a carriage return (ASCII code 13). A *tab-delimited text file* is an ASCII file whose data items (cells or fields) are delimited by

QUICK TIPS

Massaging Your Delimiters

If you're working with two programs that don't support the same delimited format, don't give up. Massage the exported file using a word processor, changing the exported file's delimiters into ones the importing application understands. For example, if you want to import a comma-delimited text file into a database program that can import only tab-delimited text files, open the text file in your word processor and use its search-and-replace feature to replace the quotes and comma delimiters with tab characters.

QUICK TIPS

Avoiding Formatting Foibles

When you're moving files between two computers — whether Macs or PCs — you may encounter formatting problems if both machines don't have the same fonts. If you open a document that uses fonts you don't have on your system, you're likely to see a lot of oddly spaced text in the Courier font.

One solution to this problem is to make sure your Mac contains all the fonts used in the original document. Another solution is to use Adobe's SuperATM, a new-and-improved version of the legendary Adobe Type Manager utility, which uses PostScript Multiple Master fonts to let the Mac display smooth-looking text at any point size. SuperATM does this, too, but it also automatically generates substitute fonts whose widths match those of missing ones. The resulting document won't look exactly like the original, but at least its line endings and overall formatting will be the same.

tabs. Some programs and programming languages create text files that use commas as delimiters. Commas cause problems, however, because they can appear within values themselves ("10,000", "Raynak, Margaret"). Programs that delimit with commas do what I did in the previous sentence — enclose each data item within quotes, and then separate each quoted item with a comma.

Graphics exchange formats

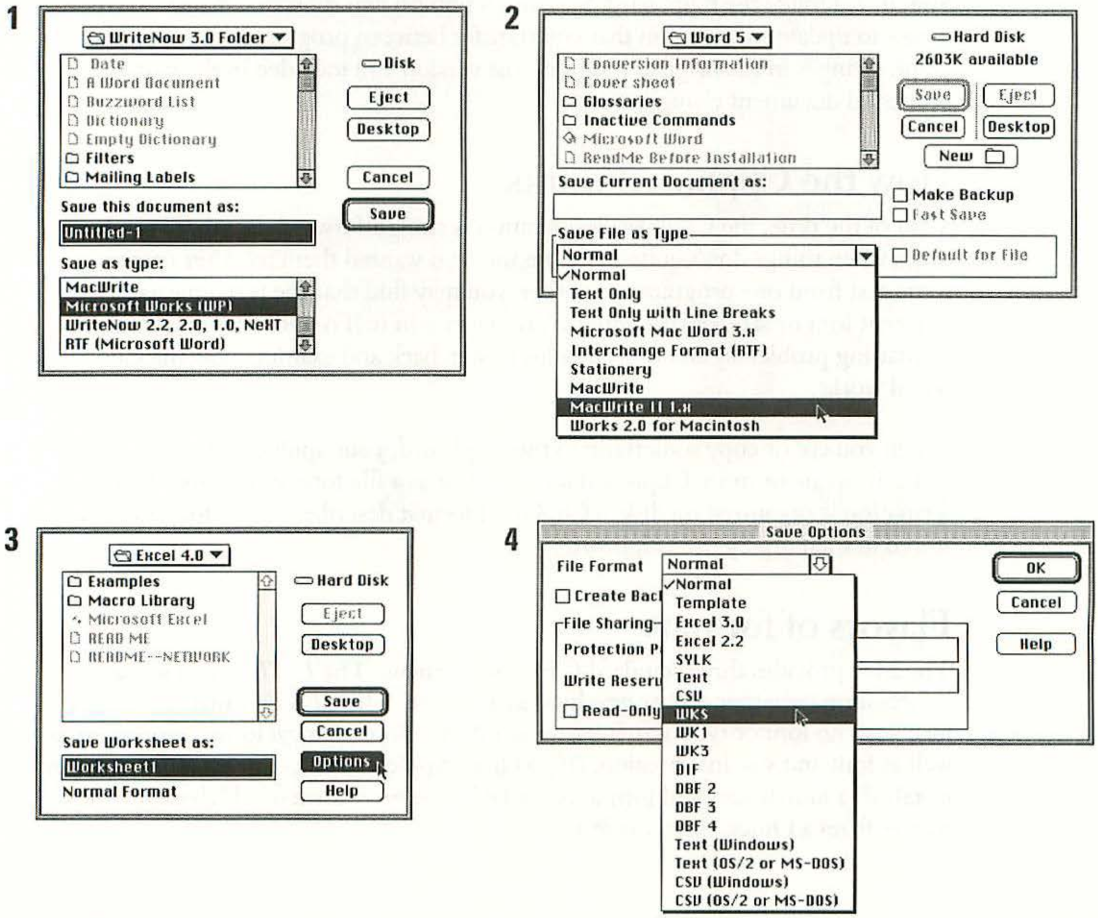
There are interchange formats aplenty for graphics. For bitmapped graphics such as scanned images, you'll probably want to use the *tagged-image file format*, or *TIFF*. For object-oriented graphics such as illustrations created with MacDraw, the *PICT* format is a good choice (for color images, use the PICT2 format). For PostScript illustrations created by programs such as Aldus FreeHand and Adobe Illustrator, use the *Encapsulated PostScript*, or *EPS*, format. Each of these formats is supported by major graphics programs as well as desktop publishing software and even many word processors, including Microsoft Word, WordPerfect, and MacWrite Pro.

Using a native format as an interchange format

Several programs' native file formats have become so widely supported that they can serve as interchange formats. For example, every Mac word processor I know of can open and save MacWrite documents. If you need to transfer files between two programs that can't read each other's files but do support the MacWrite format, you can use this format as an intermediary step.

Always save before exporting

Before exporting a document from a given program, first save the document in the program's native format — in case you have to edit the original later. To save the document in a foreign format in most programs, you use the Save As command and then choose the desired format from a pop-up menu or button list (see Figure 28-4 "Pick a Format"). Some programs, including Claris FileMaker Pro, provide an Export command instead. Aldus PageMaker and QuarkXPress provide Export commands that let you export text from a publication. You might use their Export commands if you want to create a word-processor file containing some or all of a publication's text.



Save this document as: Untitled-1

Save as type: Microsoft Works (WP)

Save Current Document as:

Save File as Type: MacWrite II 1.x

Save Worksheet as: Worksheet1

Normal Format

File Format: WKS

Figure 28-4: Pick a Format The key to saving documents in foreign formats is usually the Save As command. Typically, a program — such as WriteNow (1) or Microsoft Word (2) — lists recognizable file formats in its Save As dialog box. An exception is Microsoft Excel; to select a different format, you must click the Options button in the Save As dialog box (3) and then choose from the File Format pull-down menu (4) that subsequently appears.

The Clipboard and Beyond

The Mac provides other ways to exchange data between programs, techniques that are either faster and easier or more sophisticated than exporting and importing disk files.

All mainstream Mac programs provide Cut, Copy, and Paste commands that let you move small amounts of information between documents and between programs. These commands are the keys to the Mac's Clipboard, the Mac's basic data-exchange system for moving text and graphics between documents and programs (see Chapter 1 if you need a Clipboard refresher course).

Many programs also support an advanced data-exchange system that is built into System 7. Unlike the Clipboard, System 7's publish and subscribe feature makes it easy to update information that you transfer between programs: When the bar graph changes in the original program, the version you included in the word-processed document changes, too.

How the Clipboard works

Most of the time, the Clipboard's operation is straightforward. But there can be times when things don't quite paste the way you wanted them to. After pasting some text from one program to another, you may find that the text appears in a different font or size, or that you can no longer edit it. To understand why these formatting problems can occur, it helps to step back and examine how the Clipboard works.

When you cut or copy something to the Clipboard, your application program stores it in one or more Clipboard formats. Just as a file format describes how information is organized on disk, a Clipboard format describes how information is stored in memory by the Clipboard.

Flavors of formats

The Mac provides three standard Clipboard formats. The *PICT* format stores information (whether text or graphics) as a picture. The *TEXT* format stores only text, with no font or type-size formatting information. The *styl* format stores text as well as font and size information. (If you have Apple's QuickTime system extension installed, a fourth standard format is available: the *moov* format, which stores the frames from a QuickTime movie.)

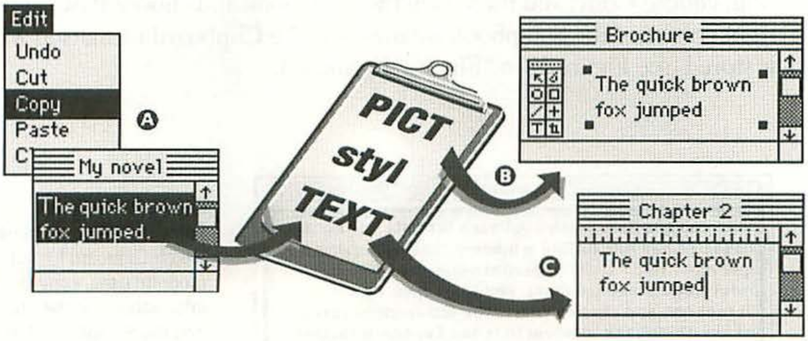
Besides these standard Clipboard formats, the Clipboard also supports private data formats — formats defined by a specific program. Private formats are designed to reflect the type of information a particular program creates, and retain more formatting information than is retained by the standard Clipboard formats.

Application programs usually place data on the Clipboard in one or more standard formats as well as one or more private formats. Why so many formats? To increase the odds of being able to retain as much formatting as possible when you paste the information into another program.

Clipboard formats in action

When you choose Paste, the receiving program peruses the Clipboard in search of a private format it can understand. If it finds one, it pastes the data using the private format, thereby retaining all formatting information. If the program doesn't find a private format it understands, it uses whichever standard format — TEXT, PICT, or styl — it prefers. For example, word processors work with text, so they generally choose the styl or TEXT format. Graphics programs work with images, so they may prefer the PICT format. Figure 28-5 "Understanding Clipboard Formats" summarizes these formatting follies.

UNDERSTANDING CLIPBOARD FORMATS


Edit
Undo
Cut
Copy
Paste
C
A
My novel
The quick brown fox jumped.
PICT
styl
TEXT
B
Brochure
The quick brown fox jumped
C
Chapter 2
The quick brown fox jumped

When you cut or copy some information from within an application program , the program usually places it on the Clipboard in several formats (A). When you paste the information into a different program, that program will choose the format it prefers. In (B), the receiving program has chosen the PICT format, which transforms the text into a graphic image. In (C), the receiving program prefers the TEXT format, and accepts the data as text.

Figure 28-5: Understanding Clipboard Formats

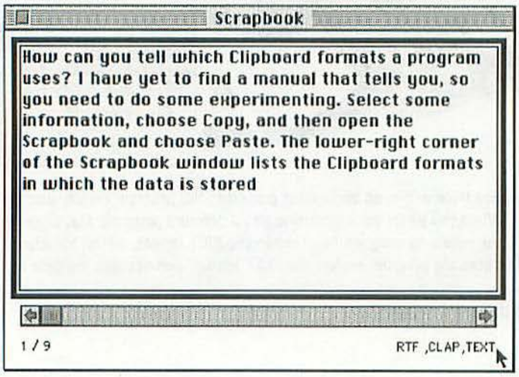
An example may help clarify how programs treat Clipboard formats. Say you've just copied several cells from a Microsoft Excel spreadsheet because you want to paste them into a Word document. One of the many Clipboard formats Excel uses is called RTF — short for rich-text format, a format that retains formatting information. (The RTF Clipboard format is very similar to the RTF file format I described earlier in this chapter.) Microsoft Word 5 can read this format, so when you paste the cells into a Word document, all the cell formatting is retained.

But what if you paste the cells into WordPerfect, which can't read the RTF Clipboard format? In this case, WordPerfect uses a Clipboard format it does understand — TEXT — and accepts the contents of the cells, but without any formatting.

So, when some text you paste loses its formatting, it's probably because the only Clipboard format both programs support is the TEXT format, which discards formatting information. To retain formatting when using the Clipboard to transfer text between programs, use programs that support each other's private Clipboard formats or the styl format. If you can't, disk files may be a better medium for transferring text between two programs, because both programs probably support at least one file format that retains formatting information.

Determining formats

How can you tell which Clipboard formats a program uses? I have yet to find a manual that tells you, so you need to do some experimenting. Select some information, choose Copy, and then open the Scrapbook and choose Paste. The lower-right corner of the Scrapbook window lists the Clipboard formats in which the data is stored (see Figure 28-6 "Finding Formats").



How can you tell which Clipboard formats a program uses? I have yet to find a manual that tells you, so you need to do some experimenting. Select some information, choose Copy, and then open the Scrapbook and choose Paste. The lower-right corner of the Scrapbook window lists the Clipboard formats in which the data is stored

Figure 28-6: Finding Formats To determine which Clipboard formats a program uses, copy some information and then paste it into the Scrapbook. The formats appear in the lower-right corner of the Scrapbook window. If you cut or copy that Scrapbook page and then paste its contents into a program, the program can choose between any of the listed formats.

Using Publish and Subscribe

When you copy and then paste something from one document to another, there's no connection between the receiving document and the original document. If the information in the original document changes, you need to repeat the copy-and-paste routine in order to update the information in documents containing it.

System 7's publish and subscribe data-exchange system enables you to link documents so that when information changes in one document, copies of it in other documents are updated automatically. The publish and subscribe system also lets you exchange data between Macs connected over a network — another feat the Clipboard can't match. Most popular programs support publish and subscribe; check out your favorite program's Edit menu: If you see a submenu named Publishing or Editions or commands such as Create Publisher and Subscribe To, the program supports publish and subscribe.

To use publish and subscribe, you must first select the information you want to exchange and choose Create Publisher from the Edit menu. When you perform this step, the Mac creates a file called an *edition,* which contains a copy of the information you published. As with the Clipboard, the information may be stored in a variety of formats (indeed, editions support the same standard formats — PICT, TEXT, and styl — as the Clipboard).

QUICK TIPS

Data Exchange Recommendations for Beginners

Publish and subscribe and System 7's other cutting-edge data-exchange features are impressive, but in the real world, they're often overkill. I've encountered many Mac owners who haven't yet mastered the Clipboard and its Cut and Paste features. If you're in this group, spend some time exploring the Edit menu. Copy a chart from a spreadsheet and paste it into a word processor. Stash your name and address in the Scrapbook desk accessory so you won't have to retype it.

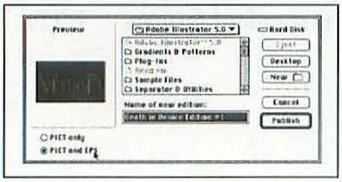
After coming to terms with the Clipboard, you'll probably start thinking of ways to use publish and subscribe to streamline your data-exchange endeavors. You'll start combining programs to create documents you couldn't create with any single program. The way in which the Mac lets you sling text and graphics between programs has always been one of the machine's unique strengths. Take advantage of it.

To put the published information into a document, choose Subscribe To from the Edit menu. The Mac automatically selects the last edition you created.

An optional third step involves telling the Mac when you want new versions of the publisher to be updated. You can specify that information be updated automatically whenever the original document is saved, or only when you explicitly request it (see Figure 28-7 "Updating Options").

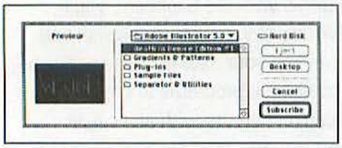
Publish and Subscribe in Graphic Design

Say you're a designer using Aldus PageMaker to create a brochure for some new clients who keep changing their minds about the logo design, which you created in Adobe Illustrator. Rather than go through the work of exporting and importing the logo each time it's revised, you can use publish and subscribe.



To publish the logo in Illustrator:

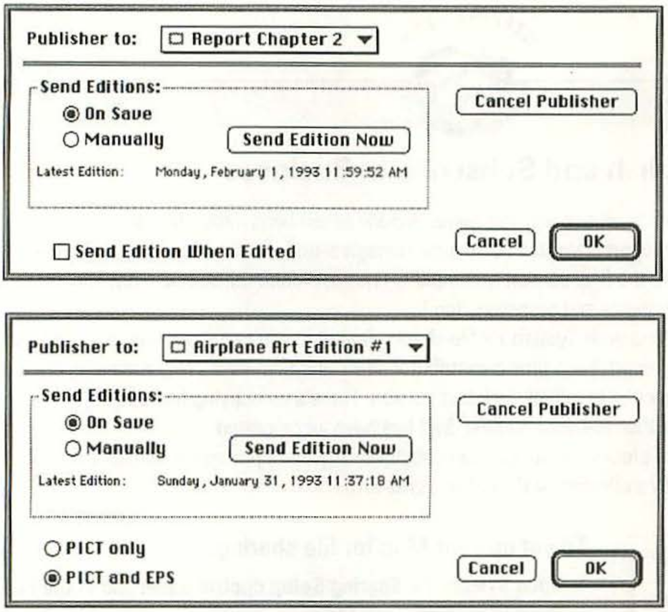
1. **Select the logo by clicking it once.**
2. **Open the Publishing submenu (in the Edit menu) and choose Create Publisher.**
   The Create Publisher dialog box appears.
3. **Be sure the button labeled PICT and EPS is checked.**
4. **Type a name for the edition file and click Publish.**
   At this point, you can quit Illustrator if you like. If you have enough memory to keep both Illustrator and PageMaker open, you may want to do so in order to see publish and subscribe in action.



To subscribe to the logo in PageMaker:

1. **Open the Editions submenu (in the Edit menu) and choose Subscribe To.**
2. **Be sure the correct edition file is selected and then click Subscribe.**
   In a moment, the PageMaker mouse pointer changes shape to indicate that it's "loaded" with a PostScript illustration.
3. **Click on the layout to place the illustration.**

   Now when you change the original logo and then save it, the version in PageMaker will be updated to match it.



Publisher to: Report Chapter 2

Send Editions:

● On Save

○ Manually

Latest Edition: Monday, February 1, 1993 11:59:52 AM

☐ Send Edition When Edited

Publisher to: Airplane Art Edition #1

Send Editions:

● On Save

○ Manually

Latest Edition: Sunday, January 31, 1993 11:37:18 AM

○ PICT only

● PICT and EPS

Figure 28-7: Updating Options A program's Publisher Options dialog box lets you specify when updated information should be sent to subscribers — automatically when you save the document, or only when you specify. Most programs add additional options to their Publisher Options dialog box. Microsoft Word (top) lets you specify that editions be updated as soon as you make changes (choosing this option can slow Word's performance). Adobe Illustrator (bottom) lets you specify whether the edition should contain a PICT version of the image or both PICT and Encapsulated PostScript (EPS) versions.

OLE — Data Exchange, Microsoft Style

Some Microsoft programs, including Word and Excel, support an additional data-exchange system called *object linking and embedding*, or *OLE*. (Aldus PageMaker 5 also supports OLE.) OLE was developed by Microsoft and is a key data-exchange mechanism in the Microsoft Windows operating environment.

OLE is popular in the Windows world, but is less so in the Mac world, where Apple, not Microsoft, sets the standards. Nonetheless, OLE is supported by three of the Mac's most popular programs — Microsoft Excel and Word, and Aldus PageMaker 5 — so it deserves a look.

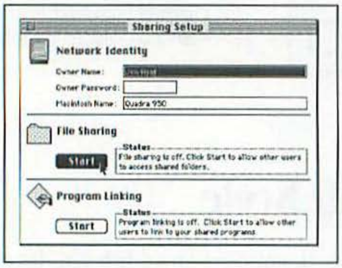
It's also worth examining because future versions of the Mac's system software will support similar data-exchange techniques. Apple is working on a data-exchange system, called OpenDoc, that will enable what's often called *in-place editing:* the ability to edit imported data without having to return to the application program that created it. For example, in the world of Amber, if you double-click a spreadsheet table that you imported into a word processor document, your menu bar changes to reflect the spreadsheet program's menus. If you double-click a graphic after you've finished your editing, your word processor's menus and tools are replaced by those of your graphics program.

Publish and Subscribe in Business

In this scenario, you work in an office whose responsibilities include assembling a monthly status report for the executive staff. The report is written by several managers, and each manager's contribution undergoes several revisions before the final version is complete. (This is a common scenario not only for status reports, but for technical manuals and proposals, too.)

By using publish and subscribe along with System 7's file-sharing features, you can streamline the process of assembling and updating each report. Each time a contributor alters and then saves his or her section, the master version of the report is changed to reflect the latest version. There's no copying and pasting needed, and no fretting about whether someone's latest draft has been incorporated.

I use Microsoft Word for the word processor, but you can substitute any word processor that supports publish and subscribe, including WordPerfect or Claris MacWrite Pro.



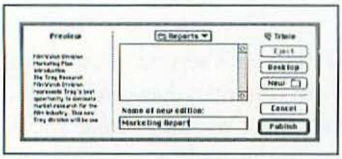
Macintosh Name: Quadra 950

Status
File sharing is off. Click Start to allow other users to access shared folders.

Status
Program linking is off. Click Start to allow other users to link to your shared programs.

To set up your Mac for file sharing:

1. **Open System 7's Sharing Setup control panel and in the File Sharing section, click Start.**
2. **Select your hard disk icon or the icon of a folder on your hard disk and then choose Sharing from the Finder's File menu.**
3. **In the Sharing window, check the box labeled *Share this item and its contents*.**
   Specify access privileges for the drive or folder if you like. See Chapter 23 for details.
4. **Close the Sharing window and click Save or press Return when asked to save changes.**
   After performing the above steps, use the AppleShare option in each Mac's Chooser desk accessory to connect to the shared hard disk or folder. The process of connecting to a shared hard disk is described in more detail in Chapter 23.



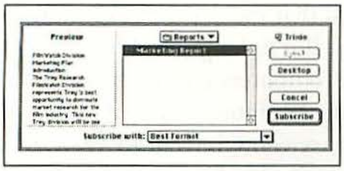
Name of new edition: Marketing Report

To publish a contribution to the report:

1. **Write your section, formatting it as you normally do, and then save it on your own — not the shared — hard drive.**
2. **Choose Word's Select All command (Edit menu).**
   Word selects the entire document.
3. **Choose Create Publisher from the Edit menu.**
   The Create Publisher dialog box appears.
4. **Click the Desktop button and then locate and double-click the name of the shared hard drive.**
   This tells Word to save the edition file on the shared drive.
5. **Type a name for the edition file and then click Publish.**

(continued on the next page)

(continued from the previous page)



Subscribe with: Best Format

To assemble the report from each component:

1. **Choose New from Word's File menu.**
   A new, untitled document window appears.
2. **Create any special title page you may want.**
3. **Choose Subscribe To from the Edit menu.**
   The Subscribe dialog box appears.
4. **Navigate your way to the shared hard drive, and then locate and double-click the name of the edition file containing the first section of the report.**
   Word inserts its text.
5. **If you want the next section to begin a new page, insert a page break after the text by pressing Shift-Enter.**
6. **Repeat Steps 1–5 until you've inserted all sections.**
   You can't perform major editing on published information that you've subscribed to. You can reformat all of the text in a publisher — change its font, size, and style as well as margins and line spacing — but you can't, say, correct a misspelled word or change the font for an individual heading. This is why each contributor performs formatting at his or her machine. (Remember that style sheets, which are covered in Chapter 4, can help automate formatting.)

   Keep in mind that each contributor can use publish and subscribe *within* his or her own section. Wendy may use it to link a graph created in Lotus 1-2-3 to the original spreadsheet that generated it, and Roy may use it to incorporate inventory figures from an accounting program. As the underlying documents change, a game of digital dominos occurs: Each contributor's section is updated, causing the master report to be updated, too. (You can even take the game one domino further: If you publish the final report and then subscribe to it within Aldus PageMaker, the publication will be updated with each revision.)

Besides making data exchange more efficient, Amber may enable developers to create smaller application programs that can work together, rather than the current trend toward huge, bloated programs that try to do everything themselves. Like System 7's publish-and-subscribe mechanism (and unlike Microsoft's OLE), Amber will also let you exchange data across networks.

Exchanging data by linking

Linking is similar to using publish and subscribe, in that the data you exchange can be updated when the original information changes. But linking also differs: It doesn't use edition files and it doesn't work across computers on a network. Also, to establish links between two files created in different programs — such as a Word document and an Excel spreadsheet — you must have enough memory to have both programs open simultaneously. And, obviously, you need to have both programs. This isn't the case with publish and subscribe, where one program can access editions created with any program.

You establish a link by first cutting or copying some information in a program that supports links, and then using a Paste Special or Paste Link command. After you establish a link, you can control how and when it's updated, usually by using an Edit menu's command called Link Options.

Exchanging data by embedding objects

Embedding is the other half of OLE: It's similar to pasting, except that the program in which you embed information keeps track of the name of the program that created the information. Information that you embed is called an *object.* If you need to modify an embedded object, you double-click on it, and an *object window* opens that contains the information. If the object came from a different program, the Mac starts or switches to that program, which opens the object window.

After you modify the object and close the object window, the information is updated in the document in which you embedded it. If you embed an object from a different program and you want to edit the object, your Mac must have enough memory to run both programs simultaneously.

Comparing OLE and publish and subscribe

OLE is often faster and more convenient than publish and subscribe. On the down side, OLE doesn't let you link documents across a network (unlike publish and subscribe) and it's supported by only a few Microsoft programs as well as Aldus PageMaker 5. Also, OLE can get confused if you rename files or move them to other folders or disks. System 7's publish-and-subscribe feature doesn't get lost as easily.

The Quick Tips box "Data-Exchange Techniques Compared" compares the three data-exchange techniques in more detail.

QUICK TIPS

Data-Exchange Techniques Compared

Included in this box is a comparison of the three data-exchange techniques.

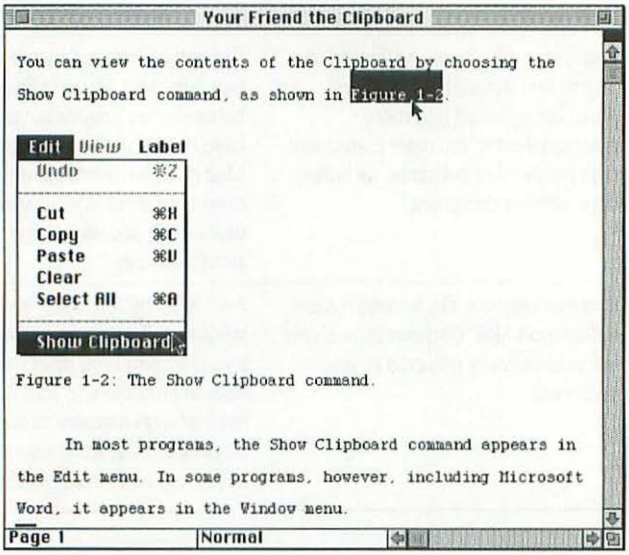
Technique	***Pros***	***Cons***
Publish and Subscribe	Supported by a large number of programs. Doesn't require programs to be open simultaneously. Works across networks and many users can subscribe to a single edition. You can subscribe to an edition created by a different program without having to have that program on your Macintosh.	Requires three files; it can be cumbersome to move files to a different machine via floppy disks.
Linking	Requires a maximum of two files (the source and destination), making transporting linked files more practical. Faster and more convenient than publish and subscribe for linking data within a document.	Currently supported by relatively few programs. If you're linking between two programs, you must have the second program and your Mac must have enough memory to open both simultaneously. Other users can't access a linked file simultaneously.
Embedding	Requires only one file, making it easy to transport files. Changes in an object are automatically reflected in your document.	Supported by relatively few programs. If you're linking between two programs, you must have the second program and your Mac must have enough memory to open both simultaneously. Other users can't access an embedded object.

In the end, if you work primarily by yourself and you use Microsoft programs or PageMaker 5, you lean toward linking and embedding. On the other hand, if you work on a network and you use a wide variety of applications, publish and subscribe is probably the better exchange medium.

Linking and embedding to update figures

In reports and manuals, it's common to have references to figures or illustrations, each of which has numbered captions. It's also all too common to add and remove figures during revisions — a chore that forces you to renumber all the figure references and their captions. By using Word's Paste Link command, you can simplify the process so that when you update a figure reference, its caption is updated, too.

Here's how: When you need to create a figure caption, select the figure number in the figure reference and then choose Copy (see Figure 28-8 "Fixing Figures"). Next, move the insertion point to the spot where you want the caption to appear. Press and hold down the Shift key and choose Paste Link from the Edit menu. Complete the caption with any additional text. From this point, when you change the figure number in the reference, the number in the caption is changed, too.



Your Friend the Clipboard

You can view the contents of the Clipboard by choosing the Show Clipboard command, as shown in Figure 1-2.

Figure 1-2: The Show Clipboard command.

In most programs, the Show Clipboard command appears in the Edit menu. In some programs, however, including Microsoft Word, it appears in the Window menu.

Page 1 Normal

Figure 28-8: Fixing Figures Here, a figure reference (the selected text) has been copied and inserted in the figure caption (below the figure) using Word's Paste Link command. If the figure number in the reference is changed, the number in the caption changes automatically.

Exchanging Files with DOS PCs

So far, I've covered exchanging files between Mac programs. Swapping files between Macs and DOS PCs involves traversing similar minefields, but to get to them you first have to move the files from one machine to the other. There are four basic ways to move documents between Macs and PCs.

Transferring with a disk drive

Using utilities such as Apple's PC Exchange, the 1.4MB SuperDrives built into today's Macs can directly access 3½-inch MS-DOS floppy disks (see Figure 28-9 "DOS on the Desktop"). The disk drive approach is easy and convenient, but it can be slow. Also, a floppy disk's limited capacity makes this option unsuitable for moving large numbers of files or large documents such as scanned images.

If you use PC media other than 3½-inch floppy disks, investigate Dayna Communications' DaynaFile II series of disk drives (which can handle 5¼-inch PC floppies) and DOS Mounter Plus software (which is similar to PC Exchange, but supports a wider array of media, including SyQuest and Bernoulli removable-cartridge drives). DOS Mounter Plus and Apple's PC Exchange also help the Mac's Finder determine which program to open when you double-click a PC file's icon. For a look at how they accomplish this, see the Background box "From Extensions to Signatures."

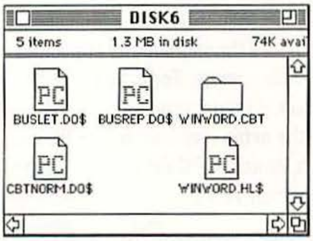


Figure 28-9: DOS on the Desktop With utilities such as Apple's PC Exchange and Dayna Communications' DOS Mounter Plus, you can work with MS-DOS floppies using the Finder. MS-DOS subdirectories even appear as folders.

BACKGROUNDER

From Extensions to Signatures

A Macintosh document is identified in the disk directory by special codes — collectively called a *signature* — that identify the application in which the document was created. The signature enables you to open a document by double-clicking it. When you do, the Mac consults the document's signature to determine which program to start. If you don't have that program, a message appears saying the document "could not be opened, because the application program that created it could not be found."

Application programs also use signatures to narrow down the list of files in their Open dialog boxes. When you choose a program's Open command, its Open dialog box shows only those documents the program knows how to open. That's because the program checks the signature of every file, and displays only those files whose signatures — and therefore, whose formats — it recognizes. This often confuses newcomers, who wonder why a document they can see when using the Finder doesn't show up when they switch to a program and choose the Open command.

The parts of a signature

A document's signature has two components — a creator code and a type code. The creator code identifies the program that created the document; this is the part of the signature the Mac uses when you double-click a document to open it. The type code identifies a document's file format — a Word document, a PageMaker document, and so on. A program uses the type code to determine which files to display in its Open dialog box.

Both the type and creator signatures are four-character codes; for example, a Microsoft Word document has a type code of WDBN and a creator code of MSWD. Both codes are stored within a document; you can't see them by looking at the document's icon or by opening the document. However, you can examine and even change a document's type or creator code using utilities such as Apple's ResEdit.

Changing signatures

Changing a signature doesn't change a file's internal format, but it can still be useful. For example, if a colleague gives you a TIFF image on a DOS disk, you can change the file's type code to TIFF in order for it to show up in a Mac graphics program's Open dialog box. (Normally, a PC file has a type code of TEXT: Most Mac graphics programs will think such a file is a text-only file and will, therefore, not display it in their Open dialog boxes.

Utilities such as Dataviz's MacLink Plus, Apple's PC Exchange, and Dayna's DOS Mounter Plus automatically give PC files signatures that enable you to open the files by double-clicking. They do this by associating a specific Mac signature with a specific PC *file extension* — a three-character suffix that appears after a PC file's name. For example, when you double-click a PC document whose name ends with DOC — the extension used by the PC version of Microsoft Word — PC Exchange tells the Mac to start Microsoft Word.

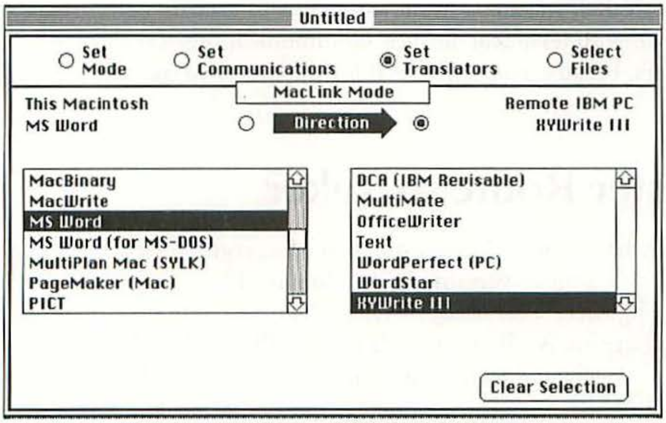
These utilities also let you modify their extension maps to better suit your software library. For example, if you use Claris Resolve, you may want to modify the extension map so that transferred Lotus 1-2-3 files acquire Resolve's signature instead of Excel's.

Transferring with a file-transfer package

Products such as DataViz' MacLink Plus/PC include a cable that connects to each machine as well as specialized communications software for each machine (see Figure 28-10 "Transfer Tools"). With this technique, you can swap files that won't fit on a floppy disk. Most packages can also use modems to transfer files over phone lines — handy when the machines aren't close enough for a direct cable connection. You'll often find niceties, too, such as a logging feature that records who's accessed your machine, and password protection for guarding against unauthorized access. The cons: You need to learn the transfer software and juggle cables if you normally have different devices connected to your serial ports.

MacLink Plus/PC version 7.02 and later versions include Apple's PC Exchange extension, which enables you to insert PC disks in a Mac's floppy drive and work with them as you normally would. MacLink Plus/PC also includes Apple's Easy Open extension, which helps put an end to those annoying error messages that say a document can't be opened "because the application program that created it could not be found."

When you double-click a document that normally can't be opened because its creator is missing, Easy Open steps in and searches for programs and translation utilities that are capable of opening the document, and then lists them for you. After you select an alternate program, Easy Open manages the conversion of the



● Set Translators

This Macintosh: MS Word

○ Direction ●

Remote IBM PC: XYWrite III

MacBinary
MacWrite
MS Word
MS Word (for MS-DOS)
MultiPlan Mac (SYLK)
PageMaker (Mac)
PICT

DCA (IBM Revisable)
MultiMate
OfficeWriter
Text
WordPerfect (PC)
WordStar
XYWrite III

Figure 28-10: Transfer Tools With Dataviz's MacLink Plus/PC, the first step in transferring files is to specify how (or whether) to translate them. When you click on a file format in one scroll box, the other scroll box changes to list only those formats MacLink Plus/PC can translate to. Here, MacLink Plus/PC is set up to translate a Microsoft Word document into XyWrite III format. After choosing translators, you click the Select Files button to select the files to be moved.

document by using that program's built-in translation capabilities or by using a translation utility you'd previously installed.

Transferring with a network

Equip a PC with a LocalTalk expansion board, and it can access a Mac hard drive made available with System 7's file sharing features or with file-server software such as AppleShare. The pros: It's relatively fast and very convenient, especially if you transfer files frequently. You can access the other camp's hard disks as if they were connected to your machine, opening files directly or transferring them using the Finder. And a LocalTalk-equipped PC can share a PostScript laser printer with Macs. The cons: It's relatively expensive; PC LocalTalk boards cost a few hundred dollars, plus $50 to $75 for each network connector kit. Networks require setup and maintenance time, and their software reduces the memory available for programs. (See Chapter 33 for more details on networks.)

Transferring with communications software

If you already have communications programs for your Mac and PC, you can swap files using modems or a null modem cable (the ImageWriter I cable works well). If you use modems, you can upload files to a communications service, and then download them to the other platform. Or you can call the other computer directly (see the Quick Tips box "Computer to Computer"). The pros: It's generally inexpensive, because you may not need to buy any additional software. And communications services make convenient "drop boxes" that eliminate the need for two people to be at their machines at the same time to exchange files. The cons: It's slow and filled with technical hurdles. Communications services can be costly for large transfers, because you're charged for the time you spend online.

Which Transfer Route to Take?

If you already have a SuperDrive-equipped Mac, combine it with Apple's PC Exchange or Dayna's more-versatile DOS Mounter Plus. If you don't have a SuperDrive, Kennect Technology's Drive 2.4 external floppy drive and Rapport adapter combination is a better buy. If you use PC media other than 3½-inch floppy disks, investigate Dayna Communications' DaynaFile II series of disk drives.

What's ahead for Mac-PC file swappers? Less work. The DOS-on-the-desktop approach offered by network software and the Apple SuperDrive/DOS utility com-

QUICK TIPS

Computer to Computer

Using a communications program to transfer files between computers can be a trying experience. Here are some tips that will help you make a successful transfer.

- *Get the right cable* For direct cable connections, be sure your cable is wired properly. Standard RS-232C cables don't work; your cable must be wired as a null modem, which tricks each machine into thinking it's talking to a modem. A competent computer dealer can supply the cable you need.
- *Check your settings* Both the receiving and transmitting programs must speak the same language at the same speed. Typical settings for cable connections are 9600 bps, 8 data bits, 1 stop bit, and no parity. For 1200-bps modems, use 1200 bps instead of 9600. And to see what you're typing, turn both programs' local echo options on.
- *Use transfer protocols* File-transfer protocols eliminate garbled data by "proofreading" data as it's sent. The most popular transfer protocol is called XMODEM, although it's being supplanted by a faster, more convenient protocol called ZMODEM. If you're using XMODEM for Mac-to-Mac transfers, be sure to use MacBinary XMODEM; it transfers the special information in Mac files, such as their signatures and icons.
- *Plan ahead* For modem transfers, talk to the other person and settle on communications settings and transfer protocols, and on who should call whom. Next, the person at the receiving end puts his or her program in answer mode and the sender invokes his or her program's dial command. When a connection is made, type a few characters to verify settings, and then invoke the transfer commands.

bination is already making it easier to access PC files. The next step is transparent translation — the kind XTND provides when teamed with Dataviz's translators. As more developers adopt the XTND file-translation technology, we can look forward to a day when translation occurs behind the scenes regardless of which program you use.

In the meantime, if you anticipate frequent Mac-PC swapping, you can minimize migraines by using programs that share formats. A few examples include Microsoft Word, Excel, and PowerPoint; WordPerfect; Claris FileMaker Pro and ClarisWorks; Aldus PageMaker, and QuarkXPress.

The Adobe Acrobat Angle

For people who routinely need to shuttle documents from one computer — or computing platform — to another, one of the most exciting developments in data exchange is Adobe Acrobat (which you may have heard referred to by its development code name, Carousel). Acrobat is designed to overcome the classic problems of file exchange — Computer B not having the same application programs and/or fonts as Computer A. Acrobat lets you electronically send documents created on your machine to other machines, regardless of the operating system, hardware configuration, and font configuration they use.

How it works

Adobe Acrobat cleverly combines several of Adobe's best technologies — the PostScript language, with its device independence; Multiple Master fonts, with their stretch-and-squeeze versatility; and Adobe Type Manager, with its ability to whip up a tack-sharp font in any font size.

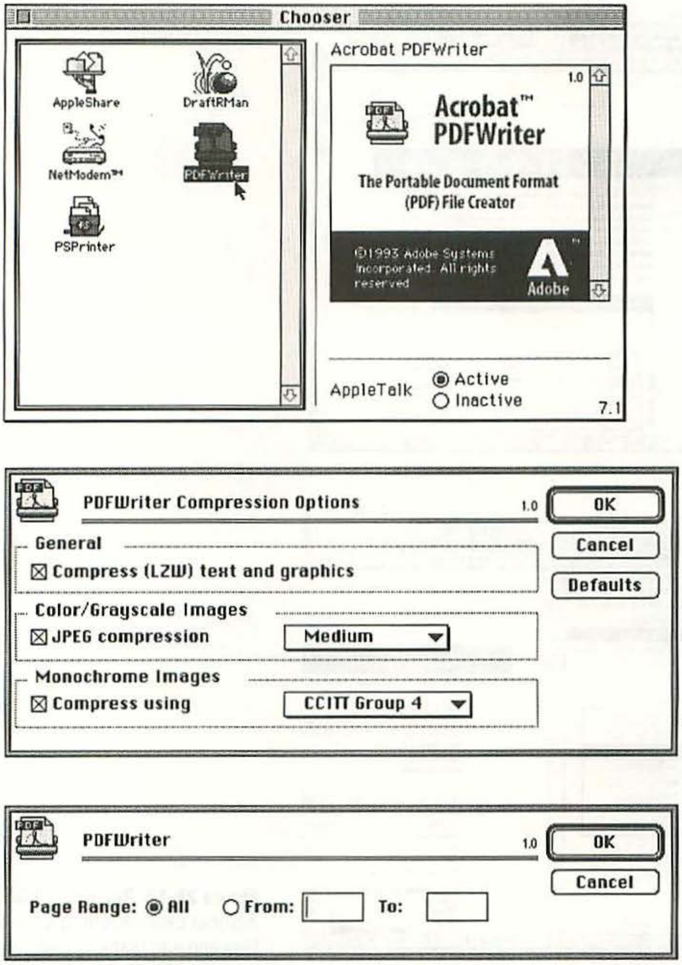
An electronic document created using Acrobat is called a *Portable Document Format* (PDF) file. A PDF file is a PostScript-based file format that preserves the text, graphics, and formatting of the original document. To create a PDF file, you use the Acrobat PDF Writer. The PDF Writer works like a printer driver: Select it using the Mac's Chooser desk accessory, choose your application program's Print command, and the PDF Writer displays a special Print dialog box (see Figure 28-11 "Creating a PDF File").

The PDF Writer translates the Mac's QuickDraw graphics commands into Acrobat's PDF format. PDF files carry information about the fonts used in your document — their widths, names, and styles — as well as the text and graphics of the document. Built-in compression features reduce file sizes dramatically. (For example, color and grayscale images can be compressed by a factor of 10 to 1.)

Reading PDF files

After you create a PDF file, you can beam it to a colleague, who can use the Adobe Acrobat Exchange or Reader applications to read the file. These programs decompress PDF files and use Adobe Multiple Master fonts to mimic the typefaces used in the document. (If the actual typefaces are available on your colleague's system, the program uses them.)

To make it easy to scan a document, the Acrobat Exchange displays thumbnails of each page. When you find a page you want to read, you can use a zoom command to enlarge it to normal size (see Figure 28-12 "Reading a PDF File").



Acrobat PDFWriter

AppleTalk ● Active ○ Inactive

PDFWriter Compression Options

General

☒ Compress (LZW) text and graphics

Color/Grayscale Images

☒ JPEG compression Medium

Monochrome Images

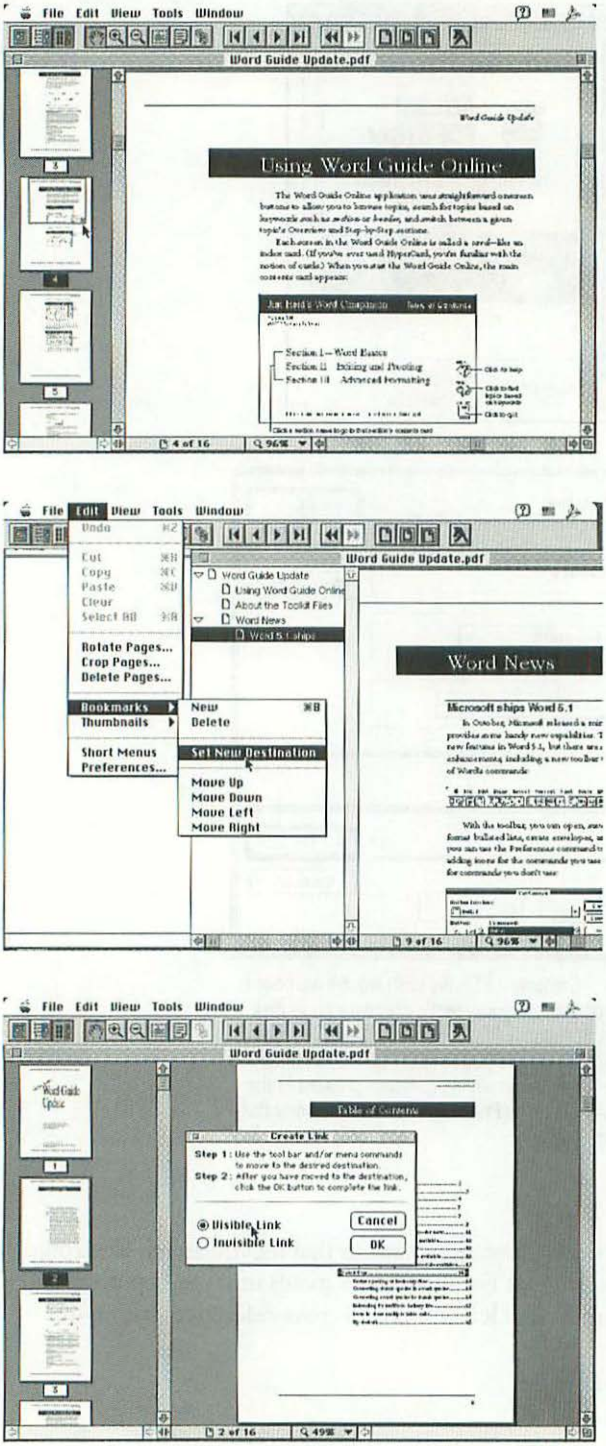
☒ Compress using CCITT Group 4

PDFWriter

Page Range: ● All ○ From: To:

Figure 28-11: Creating a PDF File Creating a PDF file with Adobe Acrobat is a lot like printing a document, except that the document's contents go to disk instead of to a printer. First, select the Acrobat PDF Writer using the Chooser desk accessory (top). Next, you might fine-tune page setup options, such as the type of compression the PDF Writer uses when saving graphics present in the original document (middle). Finally, choose the Print command and specify the pages you want to save in PDF form (bottom).

Acrobat Exchange also provides annotation features that let you attach electronic Post-it notes to documents. Acrobat Exchange even treads into the hypertext world, offering a linking feature that lets you create cross-references within or across PDF documents.



Step 1: Use the tool bar and/or menu commands to move to the desired destination.
Step 2: After you have moved to the destination, click the OK button to complete the link.

Figure 28-12: Reading a PDF File Adobe's Acrobat Exchange program lets you read PDF files and add features that make them easier to navigate. Acrobat Exchange can display thumbnail versions of each page (top). To move to a different page, double-click its thumbnail. You can also zoom in or out on a page by adjusting the size of the gray border on the thumbnail. With Acrobat Exchange's Bookmarks submenu (middle), you can create electronic bookmarks that let you jump to a given section with a double-click. Bookmarks can have a hierarchical outline structure that shows the organization of sections in your document. With the small, Finder-like triangles, you can collapse and expand this outline to show as much detail as you like. Acrobat Exchange also lets you create links between portions of a document (bottom). Here, an entry in a document's table of contents is being linked to the section it refers to — double-clicking the table of contents entry takes you to its section.

Reading a chapter with Acrobat

To illustrate Acrobat's capabilities, IDG Books worked with Adobe to create a PDF file containing Chapter 26 of this book. Adobe's Christopher Warnock created the file and created hypertext links between the chapter's various sections and figures. If you have Adobe's Acrobat Exchange or Reader programs, you can read the PDF file, which is on the *Macworld Complete Mac CD.* See Appendix A for more details.

The future of Acrobat

Acrobat's capabilities are impressive now, but the future looks even better. Adobe plans to offer Acrobat publishing tools that will allow on-line or CD-ROM–based distribution of publications. Other plans include support for optical character recognition software that will scan hard copy directly into PDF as well as PDF editors for video and sound.

CHAPTER 28 CONCEPTS AND TERMS

- Every type of program has its own document-storage requirements. The organization of data in a file — the characters, their formatting codes, and the file signature — is called a file format.
- The key to exchanging files between programs is to find a file format that both programs understand. Oftentimes, this means using an interchange format — a file format designed for exporting and importing data — such as TIFF, EPS, RTF, or SYLK.
- ASCII (the American Standard Code for Information Interchange) is a set of 256 codes, each representing a letter, number, special character, or control code such as a tab. Most programs that deal with text can save and open text-only files — files containing only ASCII codes.
- There are four basic ways to move documents between Macs and PCs — with a disk drive, with a file-transfer package, over a network, or using communications software.
- The Mac's Clipboard stores information in a variety of formats. If information you paste loses its formatting, it's probably because the receiving program does not understand the original program's Clipboard formats.
- System 7's publish and subscribe feature and Microsoft's OLE technology let you create links between documents so that you don't have to repeat the cut-and-paste routine when the information in an original document changes.
- Adobe Acrobat enables you to exchange formatted documents between computers, even if the machines don't share the same application programs and fonts.

ASCII
Pronounced *ask-ee*, is a set of 256 codes, each representing a letter, number, special character, or a control code. ASCII stands for American Standard Code for Information Interchange.

Clipboard format
The structure of information is stored in memory by the Clipboard. When you cut or copy something to the Clipboard, a program stores it in one or more Clipboard formats.

delimiters
Characters, such as commas or tabs, that serve as boundaries that tell an importing program where one field or cell ends and the next begins. The most common field or cell delimiter is a tab character (ASCII code 9); the most common row or record delimiter is a carriage return (ASCII code 13).

edition
A small file that contains a copy of the information you publish using a program's Create Publisher command.

exporting
The process of saving a file in a non-native format.

file extension
A three-character suffix that appears after a DOS file's name and often indicates which program created the document. Extensions are similar to (but more primitive than) Macintosh file signatures.

file format
The way a particular program stores information when you use the Save command.

filters
Also called *converters* or *translators,* a small file that tells a program how to convert a particular type of foreign file.

foreign file
A non-native file format, either an interchange format or a format created by a different program. To Microsoft Word, for example, a WordPerfect document is a foreign file.

importing
The process of bringing data into a program from a different program.

interchange file format
A file format designed for moving data between programs. Examples include RTF, PICT, TIFF, and EPS.

native file format
A program's own file format — the type of file the program creates unless you specify otherwise. Compare with *foreign file.*

object linking and embedding
Abbreviated OLE, a Microsoft-developed data-exchange mechanism similar to System 7's publish and subscribe system.

Portable Document Format
Abbreviated PDF, a file format designed by Adobe Systems for its Acrobat product.

print-to-disk option
An option, provided by some database programs, that lets you create a text-only file containing those records that appear in a given report.

rich-text format
Abbreviated RTF, a Microsoft-developed format, designed primarily for swapping documents between word processors, that retains all text formatting and even graphics.

signature
Special codes that identify the application in which a Mac document was created. A document's signature has two components — a *creator* code and a *type* code. The creator code identifies the program that created the document; this is the part of the signature the Mac uses when you double-click a document to open it. The type code identifies a document's file format — a Word document, a PageMaker document, and so on.

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symbolic link format
Abbreviated SYLK, a common interchange format for swapping spreadsheets and databases.

tab-delimited text file
An ASCII file whose data items (cells or fields) are delimited by tabs.

tagged-image file format
Abbreviated TIFF, a file format, originally developed by Aldus, commonly used to store bitmapped graphics such as scanned images.

XTND
A file-translation technology that establishes a standard design for filters, so that any filter designed for XTND can be used with any program that supports XTND.

CHAPTER TWENTY-NINE

Troubleshooting

IN THIS CHAPTER

- Setting up your system
- Troubleshooting common Macintosh problems
- Tracking down printer and network problems

The Mac is reliable, but not infallible. And when problems do occur, the Mac's friendly facade can even work against you by hiding technical difficulties behind error messages that provide few clues to the problem. At times like these, the Mac almost seems to say, "Sorry, something is wrong, but I won't bore you with the details."

This chapter is a guide to troubleshooting common hardware and software problems. I've organized symptoms into three general categories — start-up and system problems, disk and Finder problems, and printing and network problems. I've provided at least one suggestion for each. (The sections that involve Font/DA Mover and the DeskTop file don't apply to System 7.) Before looking at troubleshooting specifics, here are some tips on setting up a system.

Setting Up Your System

In the old days, setting up a Mac meant plugging it in, pouring some Perrier, and listening to the New Age music on the guided tour cassette. These days, you have to wrestle with SCSI cables, expansion boards, and a slew of system files. When you're done, you may feel like sipping something a little stronger.

In this section I present a roadmap to follow when setting up a system. These tips aren't intended to replace the setup instructions in your hardware and software manuals. Always consult your manuals first for information specific to your hardware and software.

ON THE CD

- Mac Errors utility and Bomb and Crash Encyclopedia (in The Best of BMUG collection)

Step 1: Install expansion boards

If you bought any expansion boards for your Mac, install them first. The components on expansion boards and on the Mac's main logic board are extremely sensitive to static electricity, so be sure you're static-free before removing the Mac's case. (Don't shuffle across any carpets, and touch a metal light switch plate or other grounded object before starting. Consider using a wrist grounding strap if you're working in a very dry environment.)

Don't remove an expansion board from its static-free bag until you're ready to install it. You can install most NuBus boards in any slot, but check your boards' manuals to see if they have any special restrictions. And be sure your Mac is unplugged before installing or removing any board.

Step 2: Tame the SCSI bus

The next step in setting up a Mac is to properly connect it to its peripherals — the keyboard, mouse, printer, external hard disk, and any other add-ons. The most difficult aspect of Mac cabling involves interconnecting peripherals such as hard disks, scanners, and tape backup drives. These devices connect to the Mac's high-speed SCSI bus, which is covered in Chapter 27.

Keep two rules in mind when setting up SCSI peripherals:

- *Be sure each device has a unique ID number* Use the highest number (6) for an external hard disk. Use lower numbers for lower-priority hardware such as a scanner or tape-backup drive. You don't have to number devices sequentially; you can use ID number 6 for a hard disk and ID number 3 for another device, skipping over numbers 4 and 5.
- *Be sure to terminate the SCSI chain properly* Determine whether your hardware contains internal terminators, and never place more than two terminators on the bus (see Figure 29-1 "SCSI Wiring").

Step 3: Finish wiring

After you've tamed SCSI, your remaining wiring chores are child's play. They involve attaching the mouse and keyboard, and perhaps also connecting to an ImageWriter, StyleWriter, or LaserWriter printer.

On every Mac from the SE on, the mouse and keyboard use the *Apple Desktop Bus* (ADB). Like SCSI, the ADB lets you daisy chain numerous peripherals to a single connector. But unlike SCSI, ADB devices automatically configure themselves when you switch on the Mac; you don't have to fret with ID numbers and termination.

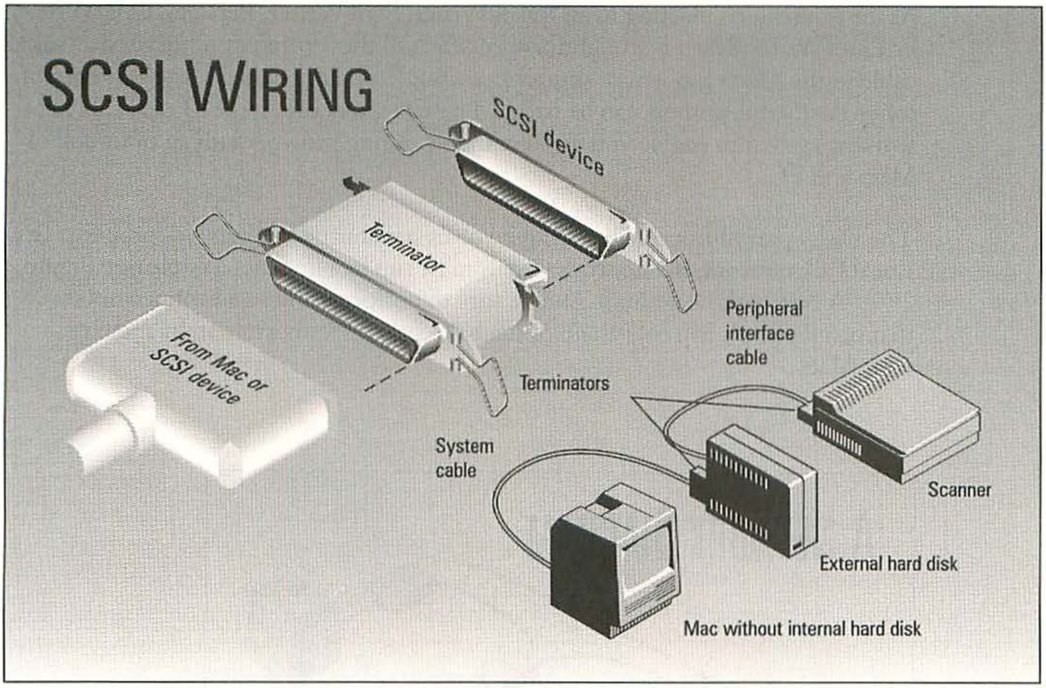


Figure 29-1: SCSI Wiring

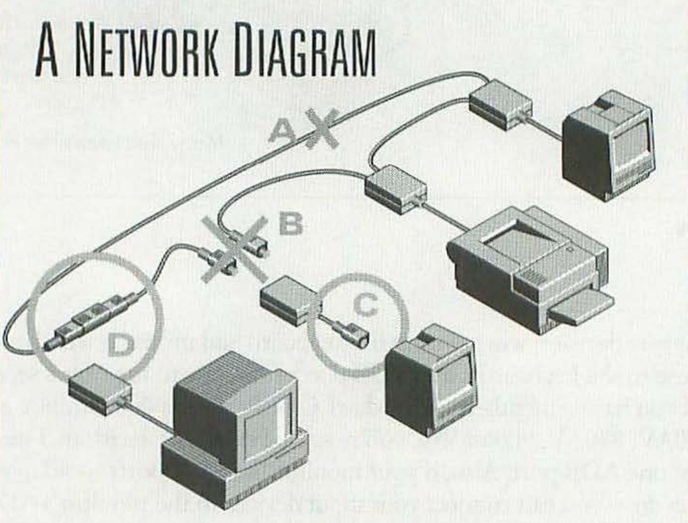
Your biggest decision when wiring the keyboard and mouse is whether to attach the mouse to the keyboard's free ADB port or directly to the Mac's second ADB port. (If you have a member of the Mac LC or Performa 400 families, a Quadra 605, 660AV, 840AV, 900 or 950, you're spared even this decision: These Macs have just one ADB port. Also, if your monitor has ADB ports — all newer Apple monitors do —you can connect your input devices to the monitor's ADB port.)

If you have a tower-style Quadra (such as the 900 and 950) or a Mac II, IIx, or IIfx, you may want to connect the mouse to the keyboard's ADB connector. This enables you to put the computer on the floor without having to buy a set of extension cables (with the II, IIx, and IIfx, use a Kensington Macintosh II stand for adequate ventilation).

Connecting the mouse to the keyboard also simplifies switching between left- and right-hand mouse operation, because it eliminates having to thread the cable over the top of the monitor and its cables. If you have an Apple AudioVision monitor, you can get the same benefit by plugging the mouse into the monitor's ADB port.

As for printers, connecting to an ImageWriter, StyleWriter, Personal LaserWriter, or LaserWriter Select is straightforward: Each of these printers connects via a serial cable to the Mac's modem or printer port. But PostScript-based LaserWriters and other PostScript printers can be tricky. These printers use Apple's LocalTalk networking system to enable you to share their printing prowess with an office full of Macs and PCs.

The tricky part of LocalTalk wiring involves structuring the network properly. In a LocalTalk network, the network signals must run in a line, not a circle (see Figure 29-2 "A Network Diagram"). And be sure to position cables and connectors so that people won't trip over them or inadvertently disconnect them by moving their Macs.



LocalTalk connectors attach cables to all the networked devices—Macs, printers, or IBM PC's equipped with LocalTalk expansion boards. Avoid a common wiring trap by never connecting the first and last device on a network and creating a closed loop **(A)**. Other problems include loose connections and dangling unconnected cables **(B)**. If you need to remove a device, either unplug its connector box **(C)** or insert a cable extender between the two dangling cables **(D)**.

Figure 29-2: A Network Diagram

Step 4: Install System software

After setting up your hardware, turn your attention to software. Time spent planning your software installation will be rewarded with faster, more efficient operation later on.

All current Macs include internal hard drives with preinstalled system software. However, if you buy an external hard drive or removable media drive and you want to use it as your start-up drive, you need to install the system software on it.

With unformatted drives and some removable-media drives, you use a special utility program included with the drive to format and test the drive or cartridge. Turn everything on (starting with the drive), and then start your Mac using the floppy disk that came with the drive. Locate and start the utility program, and follow the manufacturer's directions to test and format the drive or cartridge.

To install the System Folder and its contents on an external hard disk or cartridge, use Apple's Installer program, located on the system software disk labeled Install. If your Mac came with an internal Apple CD-ROM drive, you can install the system software from the CD that accompanied the Mac.

If you connected a new printer in the previous step, you'll want to copy its driver file to your hard disk's System Folder. Printer drivers for Apple printers are generally located on a disk named Printer Tools. For more details on printer drivers (including Apple Adobe's PSPrinter driver, also known as LaserWriter 8.0), see Chapters 30 and 32.

If you have any hardware that included extensions, control panels, or other driver software, install the software now. Usually that means simply copying one or more system extensions to the System Folder, although some hardware products include their own installer program or use the Apple Installer.

Step 5: Install applications

After installing your System software, you're ready to install your application programs. Installation routines vary between applications. You can install some programs by simply dragging their icons to your hard disk. Other programs come with their own installation programs. Be sure to follow the instructions in your program manuals. And watch that you don't copy a second System Folder to your hard disk. Having more than one System Folder (or more than one Finder or System file) on a hard disk is a common source of problems. Sometimes a superfluous System Folder can be buried within another folder, so to be sure you don't have more than one, use the Find File desk accessory (or System 7's Find command) to search for the files Finder and System. Virtually no current software package includes a System Folder on its floppies, but older products may. In any case, what's important is that you know that multiple System Folders on a single drive can cause problems.

See Chapter 26 for tips on creating a filing scheme that helps you find what you've stored.

Start-Up Problems and System Crashes

You connected a hard disk, scanner, or some other SCSI device, but the Mac doesn't recognize it.

- Check all the SCSI devices to make sure they are connected properly, with the right number of terminators in the right positions. (See Chapter 27 for details on SCSI.) Then, with the power off, disconnect and firmly reconnect all SCSI cables. Use the metal cable snaps to lock them into place.
- Make sure each device has a unique SCSI ID number. If two or more SCSI devices have the same number, one or more of them may not work.
- Be sure you've installed any system extension software that accompanies the device. Some scanners, for example, won't work unless their system extensions are in the System Folder.

QUICK TIPS

You've Rescued Me!

When the Mac crashes and takes unsaved documents with it, don't despair. Well, okay, you can despair, but don't give up hope. After restarting the Mac, open the Trash and look for a folder called *Rescued items from [your hard disk name]*. If you find such a folder, drag it out of the Trash window and onto the desktop. Now open the folder. You may see documents with bizarre names such as *Word Temp-3*. If you do, start the program you were using and try opening the file — it may contain part or all of the document you were working on when the crash occurred. If it does, thank your lucky stars and then save the document.

How's this work? Many programs create temporary files — the software equivalent of scratch paper — as they work. So even if you haven't saved a document recently (or at all), some or all of your precious keystrokes may still have been squirreled away on disk. When System 7 starts up after a crash, it looks for these temporary files and stashes them in the rescued items folder. Why does it put the rescued items folder in the Trash, where it's one command away from oblivion? Don't ask me. Just be grateful for the feature — and remember to save often.

- Be sure the total length of the cabling in your SCSI chain is less than 30 feet (the shorter the better: Some users say no longer than 20 feet) and that no single link between peripherals is more than six feet long (again, the shorter the better).

The Mac doesn't start from a hard disk that was previously working.

- If you've added any new SCSI devices since the last successful startup, double-check your SCSI cabling, termination, and address switches. SCSI is a common source of start-up problems.
- The disk's start-up information — its *boot blocks* — may be damaged. If the Mac's screen flashes the "where's the disk?" icon, or if the Mac crashes during startup, displaying the frowning Mac icon instead of the "Welcome to Macintosh" message, bad boot blocks may be to blame (but also see the next section on misbehaving extensions). You can make repairs using a utility such as Symantec's Norton Utilities for the Macintosh, Central Point Software's MacTools, or Fifth Generation's Public Utilities.
- One or more files in the System Folder may have been damaged. Try reinstalling the system software from an emergency start-up floppy. (See Chapter 27 for details on creating such a floppy.)
- The hard disk's *driver software*, which enables the Mac to recognize and access the hard disk, may be damaged. If your hard disk came with a diagnostic program, run it. Many hard disks enable you to reinstall the driver software without reinitializing (which would erase the contents of the disk).
- The crash may have corrupted the contents of the Mac's *parameter RAM*, the battery-powered memory that holds Control Panel settings, such as the time, date, and current start-up disk. (On a PowerBook, the parameter RAM also holds your system sleep settings.) Try resetting the parameter RAM. To reset the parameter RAM under System 7, start up or restart the Mac while holding down the ⌘, Option, P, and R keys. To reset the parameter RAM under System 6.x, start the Mac with a different disk, and then hold down the ⌘, Shift, and Option keys while opening the Control Panel. A dialog box asks if you want to "zap" the parameter RAM. Click Yes; then restart.
- To zap the parameter RAM on a Mac Plus or earlier machine, you must remove the computer's battery — regardless of which system you're running. Leave the battery out for 20 to 30 minutes before reinstalling it.

When you started up your Mac II-family machine, the speaker produced an usual start-up sound and the machine did not start up.

- A faulty Mac II-class machine can produce any of three "I'm not feeling well" sounds. One is a single, high-pitched tone, which generally indicates a memory problem. Try replacing memory boards (SIMMs) one at a time to isolate the faulty one.

- Another abnormal start-up sound consists of two high-pitched tones, with the second higher than the first. This, too, usually indicates a memory problem.
- The third and most common abnormal start-up sound consists of four notes, one after the other, each higher than the previous one. (Musicians: it's a broken A-major chord.) This can refer to SCSI problems, a loose or damaged memory SIMM, or loose cable connections. When you hear this one, think back on the last hardware add-on you installed and double-check that it's installed correctly. Double-check all cables, turn the Macintosh off, and then try again. If the problem persists, consider taking the computer to a service technician.

When you start up your CD-ROM-equipped Mac with a CD in the drive, the Mac freezes. Upon restarting, you hear the "chord of death" discussed in the previous section.

This problem can occur if the CD you've inserted contains invalid information in its boot blocks. (Chances are the CD was mastered improperly — a CD that isn't intended to be used as a start-up disk should not have any boot blocks at all.) Eject the CD, shut the Mac off for at least 10 seconds to clear its digital head, and then restart.

You try to start your Mac using a CD-ROM inserted in the built-in CD-ROM drive, but the Mac starts up from the hard disk instead.

In order to force the Mac to start up from the CD, you must press ⌘-Option-Shift-Delete — a real finger-twister — before the smiling Mac icon appears. The best approach is to shut the Mac off, insert the CD in the drive, and then press the ⌘-Option-Shift-Delete sequence while turning the power on. Another technique is to open the Startup Disk control panel and select the CD-ROM drive as the start-up disk.

For some information on the start-up CD-ROM that accompanies CD-equipped Macs, see the Background box "Starting Up From a CD-ROM."

You added a new system extension, control panel, desk accessory, or font, and now the Mac crashes during startup when you try to use the system extension, or when you try to start a program that was previously working properly.

- System extensions that load during startup can conflict with each other or with applications. First, remove the suspect extension from the appropriate folder within the System Folder (start the Mac with a different system disk if necessary), and then restart. If the Mac doesn't crash, blame the extension. You can often cure system extension conflicts by renaming the offending extension so that it loads in a different order (the Mac loads system extensions in alphabetical order). If that fails, contact the extension's developer. The Quick Tips box "Extension Troubleshooting Strategies" provides more guidelines for solving extension woes.

BACKGROUNDER

Starting Up From a CD-ROM

Macs with built-in CD-ROM drives can start up from a CD inserted in the drive. One reason you may want to start up from the CD is to reinstall the system software on the hard drive.

The CD that accompanies a Mac with a built-in CD-ROM drive contains System 7 with the appropriate enabler, the HyperCard Player (which lets you open HyperCard stacks), QuickTime, the Macintosh Basics tutorial, and the CD Setup utility.

You can install software directly from the CD or make a set of backup floppies from the CD. The CD uses Apple's At Ease interface utility to streamline these tasks.

Because the CD-ROM is so much slower than a hard drive, the CD is not meant to be a permanent start-up disk, but used as a backup and archive of system software.

QUICK TIPS

Extension Troubleshooting Strategies

When your System Folder is laden with extensions, finding the one that's causing a crash can be time consuming and frustrating. In this box, I describe some techniques that may help.

Step 1: Try starting up without them

With System 7, you can bypass all extensions by pressing the Shift key while the Mac is starting up. Hold the Shift key down until the message *Extensions off* appears below the *Welcome to Macintosh* message. If the desktop appears, chances are the problem is with your extensions — proceed to the next step. If the Mac still doesn't start up, the hard drive's System Folder or boot blocks may be damaged as described earlier in this chapter.

Step 2: Find the troublemaker

One strategy for troubleshooting extension conflicts is to drag all extensions out of the System Folder, and then put them back one-by-one, restarting after each, until the big bomb appears. To save time, you may try dragging only half the extensions out and then adding one or two at a time.

You may also consider a diagnostic utility such as Teknosys' Help or Maxa's Alert. Both scan your System Folder and compare its contents against databases of extensions.

Step 3: Downsize your extension collection

While you're contemplating all the time that troubleshooting wastes, think about your collection of extensions and consider getting rid of ones that aren't absolutely essential to your work. The more extensions you use, the greater the chance that two of them won't get along. Other pluses to downsizing your extension collection: Your Mac will start up faster and will have more free memory for your programs.

- System 6 only: If the Mac acts up after you add a desk accessory or a font, the System file (which holds both) may be damaged. Restart using a different system disk, and copy its System file to the disk that's giving you trouble. Make sure you're using the latest version of Font/DA Mover (at this writing, version 4.1). If the problem persists, the desk accessory or font may be damaged. It's also possible that the desk accessory is incompatible with your version of the system software; check with the desk accessory's developer.
- If the Mac crashes only when you try to use the new desk accessory, the desk accessory itself may be damaged or improperly installed. Remove the desk accessory, and then reinstall it. If the problem persists, it may be that the desk accessory's disk is defective, or the desk accessory may not be compatible with your system configuration; contact the desk accessory's developer.
- When you run MultiFinder under System 6.x, newly installed fonts and desk accessories don't always appear in the Font or the Apple menu (if this happens, try restarting the Mac). It's best to install fonts and desk accessories from the Finder.

You added a new extension, but it isn't loading during startup.

- Make sure that the new extension is stored in the System Folder, and then restart. If you're using System 7, be sure the extension is in the Extensions folder, located within the System Folder.
- Don't press any keys during startup, and be sure the Caps Lock key isn't depressed; often you can bypass loading a particular extension by pressing certain keys.

The Mac crashes when you start a program or open a desk accessory, and the ID number in the bomb dialog box is 12, 15, 25, 26, or 28.

- An ID=15, ID=25, or ID=28 system crash often indicates insufficient memory. Restart, and then try one or more of the following: Remove system extensions; use the Memory control panel to disable or reduce the size of the RAM cache. (System 6.x only: Use the Finder's Set Startup command to specify that the Mac not use MultiFinder.) Restart again to make the changes to take effect.
- An ID=26 crash indicates that the Mac's attempt to start the program was unsuccessful, perhaps due to corrupted data in memory or a damaged application file. Restart and try again. If the Mac still crashes, reinstall the application from its master disk.
- An ID=12 crash indicates that the software you're attempting to run is trying to access a system software feature that isn't supported by your current hardware and/or system software combination. For example, you may be trying to run a color program on a Mac Classic, or you may be trying to run a program that requires System 7 under System 6.x. Check the program's system requirements and verify that your Mac meets them.

POWERBOOK ANGLE

Troubleshooting PowerBooks

This box contains some advice for solving common PowerBook problems.

The speaker pops occasionally

As the old computer industry joke says, "this isn't a bug — it's a feature." Ten to 20 seconds after producing a sound (such as an error beep), the PowerBook cuts power to its sound chip in order to save battery power. When the power goes, pop goes the speaker. To eliminate the pop, insert a miniplug (Radio Shack catalog number 274-368) in the PowerBook's speaker jack. You won't hear a peep (or a pop).

When the PowerBook is connected to a network, it never goes to sleep.

If the PowerBook has the recharger cord plugged in, open the Chooser and check to see if AppleTalk is on. If it is, you've found the reason: Apple designed the PowerBook's EverWatch power-management features with the assumption that if the recharger is plugged in and AppleTalk is on, you're at your office and you want the PowerBook to be as fast and responsive as possible. (Note that the PowerBook only detects whether the recharger cord is plugged in, not whether there's current flowing through the recharger.)

The other possibility for the PowerBook not going to sleep is that AppleTalk is on and you're connected to a shared hard disk or network electronic mail service. In this case, the PowerBook is detecting periodic network activity and thus stays awake. Simply having AppleTalk active and being plugged into a LocalTalk network does not keep the PowerBook awake when the power cable is not connected.

A program slows dramatically while performing a time-consuming task. Moving the trackball wakes up the system, and processing continues.

The power consumption of the PowerBook's microprocessor is reduced automatically when it detects that no activity requiring its attention has taken place for a period of time. This is called *processor cycling.* The processor comes back up to speed instantaneously when you resume using the computer. The problem is, some programs don't work properly with processor cycling on. Try turning off processor cycling while using the program. Use the PowerBook control panel to turn off processor cycling.

The PowerBook doesn't run on the battery, but operates normally when plugged into AC power.

PowerBook 100: Check that the storage switch on the back of the computer (next to the power connector) is in the up position. This switch disables battery power, but enables you to use the unit with AC power. Another possibility: A fuse on the logic board can blow if the computer's lithium batteries aren't removed before the unit is taken apart. It's also important that the unit be completely reassembled before the batteries are reinstalled. Have the fuse replaced by a technician. And think at least twice before venturing into the PowerBook's tight confines.

Other PowerBook models: A fuse on the logic board may have blown. The black insulating "O" ring on the tip of the AC adapter may be damaged and shorting out against the logic board. Have the adapter repaired and the fuse replaced by a technician.

The Mac appears to have frozen — it doesn't respond to mouse clicks or keystrokes.

- Press ⌘-Option-Esc. If a dialog box appears asking if you want to "force-quit" the application, click Force Quit (You can't click anything if the mouse pointer is frozen, too. If that's the case, you need to press the reset switch if your Mac has one, or just power-down, wait 10 seconds, and then restart.) If the Mac responds to the Force Quit button, thank your lucky stars and immediately save any unsaved documents. Then restart the Mac to clear its head and get back to a healthy state.
- If the Mac doesn't respond, try ⌘-Option-Esc again. If this doesn't work, you need to restart the machine.

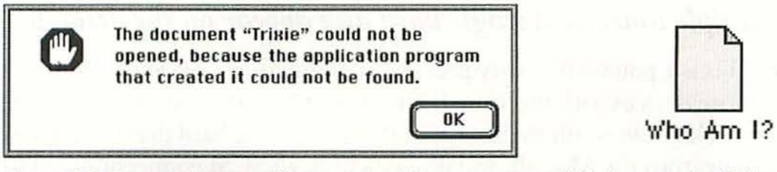
Disk and Finder Problems

When you copy files using the Finder, an error message says that some files couldn't be written or read and asks if you want to continue.

- If the Mac couldn't write some files, the destination disk could be at fault. If you're copying multiple files, try copying one at a time. If that doesn't work, the destination disk may be magnetically or physically damaged. A temporary fix that usually works for me is to use the Finder's Duplicate command to duplicate a small file on the destination disk. This causes subsequently copied files to be stored on a different area of the disk. Make sure you back up the disk as soon as possible and then erase it. If problems surface after erasing, the disk may be physically damaged. Throw out a damaged floppy; a damaged hard disk can be repaired.
- If the Mac couldn't read some files, the source disk may be the culprit. If it's a floppy or removable hard disk, try ejecting and reinserting the disk; it may not have been seated properly. If you have two floppy drives, insert the source disk in the other drive. If these techniques fail, the source disk may be damaged. Use a disk-repair utility to scan the disk for errors, a process called *verifying*. See Chapter 27 for more details on disk-repair and file-recovery utilities.

When you double-click a document, the Finder says it can't be opened because "the application is busy or missing" or "cannot be found."

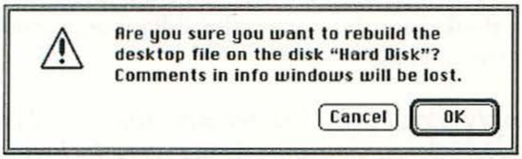
- If you don't have the application that created the document, you can't open the file from the Finder, but you may be able to open it from within another application. For example, you can open MacWrite documents from within most word processors by using the word processor's Open command. You can also use Connectix's HandOff II to assign documents to a different program. Apple's Macintosh Easy Open software provides similar features.



The document "Trixie" could not be opened, because the application program that created it could not be found.

Figure 29-3: Generic Errors When you see this error message (left), it means the Finder was unable to locate the application that created the document. Oftentimes, this occurs when you try to open or print a document that isn't intended to be opened from the Finder. Examples of such a document include an application's temporary work file or settings file, which stores your working preferences. Such documents often have generic document icons (right).

- ❖ The document may not be intended to be opened from the Finder (for example, a document that stores your working preferences or a spelling checker dictionary). If the document has a generic document icon, it probably can't be opened from the Finder (see Figure 29-3 "Generic Errors"). But again, you may be able to open it from within an application.
- ❖ The document, its application, or the disk's desktop database files (which contain information about the disk's contents) may be damaged. This is less likely than the previous situations, but it's possible. Every document file has a signature that identifies the application that created it. If this signature is damaged, either in the document or in the desktop database file, the Finder won't know which application to open. Try rebuilding the desktop (see Figure 29-4 "Rebuilding the Desktop") or using a disk utility to examine the document's file signature.
- ❖ A special file attribute, called the *bundle bit*, may be set (that is, turned on) for a file other than the application itself (such as a spelling checker dictionary). As a result, the desktop database has become confused. Most disk utilities can repair this problem.



Are you sure you want to rebuild the desktop file on the disk "Hard Disk"? Comments in info windows will be lost.

Figure 29-4: Rebuilding the Desktop One solution to certain disk ailments involves rebuilding the desktop file by restarting the Mac and then holding down the ⌘ and Option keys before the Finder's menu bar appears. Doing so causes the Finder to display the message shown here. Note that rebuilding the desktop file causes the Finder to lose any Get Info comments you may have added to that disk.

Multiple icons for a single hard disk appear on the desktop.

- This is a potentially nasty problem that indicates a SCSI problem — two or more devices with the same ID, improper termination, or faulty cabling. This problem can result in damage to the data on the hard drive. Shut down immediately, turn the Mac off, and double-check all SCSI connections, address switches, and terminators.

When you insert a disk, the Mac tells you that it needs minor repairs and asks if it should perform them.

- This usually indicates a damaged DeskTop file, which, like the desktop database files mentioned above, helps the Mac keep track of the files on a disk. (In System 7, the DeskTop file is used on floppy disks only. In System 6, it's used for high-capacity media, too.) If you click OK, the Finder rebuilds the DeskTop file.

When you insert an older disk or removable cartridge or you connect an older hard drive, the Mac tells you that it's "updating disk for new system software."

- This doesn't indicate a problem. The Finder is simply scanning your old disk (which was formatted under System 6 or an earlier version) and creating a System 7 desktop database file that enables it to keep track of the disk's contents.

When you insert a disk, the Mac tells you that it's damaged or unreadable and asks if you want to initialize it.

- Just say no — unless you want to erase the disk. If the disk has important data on it, click Cancel to eject it. Then try inserting the disk again and/or restarting the Mac; if the same message appears, the disk is sick. Use a disk utility to diagnose its ailments and, if possible, recover its contents. (Use the utility to copy those contents to another disk and then try making repairs on the copy, in case the recovery process backfires.)

- If you elect to initialize the disk and the Mac displays a message saying "Initialization Failed!" you'll know the disk is defective. Throw it out. Even if the initialization succeeds, think twice about using the disk for important work. It could be about to fail permanently.

When you choose Empty Trash, the Finder says that the Trash couldn't be emptied because one or more items were locked.

- Open the Trash and verify that the file isn't really locked: Using the Finder, select it and choose Get Info. If the Locked box is checked, click it to unlock the file. Then try throwing it away. You can also delete locked items by pressing Option while choosing Empty Trash.

- These problems can also occur when you throw away a file that the Mac is currently using — or thinks it's using. When you open a file, the Mac alters the disk's directory to indicate that the file is in use. These notations may remain unchanged until you quit the application — even if you use the application's Close command. Try quitting the application, and then throwing the document away. If that fails, hold down the Option key while dragging the document into the Trash. Then hold down Option again while choosing Empty Trash. If this fails, restart and then throw the file away. The restarting process should close the file properly. If you frequently encounter this problem with a specific disk, try rebuilding the disk's desktop.

You selected a disk (or a removable-media cartridge) and chose Put Away, but the Finder tells you that the operation can't be completed because it contains items that are in use.

- Have you started a program or opened a document on that disk? If so, you won't be able to eject the disk until you quit the program and/or close the document.
- Have you made a removable cartridge available to other users with System 7's file-sharing feature? If so, you won't be able to eject the disk until you turn file sharing off. (A free utility, UnmountIt by Jim Luther, lets you unmount and eject sharable volumes when file sharing is on.)

The Mac asks you to insert a disk that you ejected long ago.

- When you use the Eject command (or the Eject button in an Open or Save dialog box), the Mac remembers that the disk still exists, and may ask to see it again. Dragging an icon to the Trash or selecting the icon and choosing Put Away (⌘-Y) causes the Mac to forget the disk, guaranteeing you won't be asked for it again.

QUICK TIPS

When Trouble Hits, Retrace Your Steps

When the Mac suddenly starts acting up, think about what you've done recently. Did you just install a new program, control panel, or system extension, connect a new device, or reorganize your SCSI chain? Retrace your most recent steps: The answer to your problem may be in one of them. If all you find are footprints, check your SCSI bus, system software, and extensions as described throughout this chapter.

The Finder frequently displays the messages saying that there isn't enough memory to keep certain windows open, to open a desk accessory, or complete another operation.

- ❖ The Finder has run out of memory. Close some windows, eject disks, unmount file server volumes, and then try again.

When you eject a disk, a Finder error message appears saying that "the disk is so full that the folder changes couldn't be recorded."

- ❖ If a disk is full or nearly full, there may not be enough free space for the Finder to record the changes you've made to the disk's icon arrangement, Get Info comments, or folders. Click OK to close the error dialog box, reinsert the disk, delete at least one file, and then try again.

Printing and Network Problems

The Mac reports that it can't locate or access the printer.

- ❖ Verify that the start-up disk you're using is unlocked and that it contains at least 100K of free space. Many applications create temporary files during printing and can't print if the start-up disk is locked or nearly full.
- ❖ Check to make sure that the printer is connected and on-line (for ImageWriters and StyleWriters, press the Select button; most laser printers have a button labeled Online that makes the printer available or not available).
- ❖ Verify that the printer's paper supply hasn't run out.
- ❖ Use the Chooser to make sure that the printer driver and the proper connection port are selected. Then choose the Page Setup command, verify your print settings, click OK, and try again.
- ❖ For laser printers: Be sure the printer is on and that its paper tray contains paper and is properly seated. Use the Chooser to select the printer's driver. If you're using a PostScript printer and the printer's name doesn't appear in the Chooser window, the printer may not be warmed up, or you may have a LocalTalk wiring problem (refer to Figure 29-2). After the printer's name appears in the Chooser, select it, and then use Page Setup to verify print settings, and try again.

When you print to a laser printer, an error message appears saying that the printer was initialized with an earlier version and needs to be reinitialized.

- ❖ This problem is far less common today than in the past. It occurs when you use different LaserWriter driver versions on different machines in your network instead of standardizing on one version. Today's LaserWriter drivers — versions 7.x and 8.x as well as Adobe's PSPrinter driver — don't cause this problem. Still, in a network setting, it's a good idea to standardize on one driver version.

When you try to print a document on a PostScript printer, PrintMonitor or your application program reports that a PostScript error occurred.

PostScript errors represent a broad category of printing problems. They can be caused by complex PostScript illustrations, such as the informational graphics in this book. Simplify the illustration if possible — cut complex paths into smaller paths, raise flattening so that fewer line segments are required, or simplify clipping paths in masks by reducing the number of anchor points.

Memory errors can occur if a document contains more downloadable fonts than will fit in the printer's memory. Check the Unlimited Downloadable Fonts box in the Page Setup dialog box's Options dialog box and try again.

Another cause of memory errors can be an illustration that contains nested Encapsulated PostScript (EPS) files. Say you import a custom logo into an illustration to create a piece of clip art. Then you import that illustration into another illustration, which you then import into a page layout program. Each step in this scenario increases the amount of nesting of dependent EPS files. Consider breaking nested elements into separate files.

Memory-related PostScript errors are less common with Level 2 PostScript devices, which can allocate additional memory when necessary.

An excellent source of information on PostScript-related printing problems is Systems of Merritt (Mobile, AL). The company sells a variety of PostScript books and utilities.

For More Help

I've presented the most common Mac ailments here, but I haven't explored problems specific to a given program or third-party product. Your best sources for that kind of help are user groups, manuals, and firms' technical support hotlines.

But before you call the latter, be sure to compile the information the support technician will need to diagnose the problem. Take time before trouble strikes to write down your system configuration — the amount of memory, the system version (choose About this Macintosh from the Finder's File menu), the names of the extensions, control panels, and desk accessories you've installed, and a list of your peripherals. When a problem occurs, note the steps that caused it.

And before you call, take a few deep breaths. A support technician can't help you if you're panicked and panting. When you're at that level of despair, you need a different kind of hotline.

CHAPTER 29 CONCEPTS AND TERMS

- If the Mac doesn't recognize a hard disk, scanner, or other SCSI device, check all SCSI devices to make sure each has a unique address. Also verify that you have the correct number of terminators in the correct positions and that your SCSI cabling is secure and undamaged.
- If the Mac doesn't start up from a hard disk that was previously working, the disk's start-up information (its boot blocks) may be damaged. Other possibilities include SCSI problems or a damaged System Folder.
- If the Mac crashes during startup, conflicting extensions may be to blame.
- When you copy files using the Finder and an error message says that some files couldn't be written, the destination disk could be damaged.
- Common causes of printing problems include loose or damaged cables, insufficient free space on your start-up disk, or the printer being offline.
- When setting up your system, use this sequence: First, install your expansion boards, connect any SCSI peripherals, connect your mouse, keyboard, and (for modular Macs) your monitor, install the system software, and then install your application programs.

boot blocks
The portion of a disk that the Mac reads in order to begin its start-up process.

driver
Software that enables the Mac to recognize and access a device such as a hard disk or printer.

parameter RAM
The battery-powered memory that holds Control Panel settings, such as the time, date, and current start-up disk. On a PowerBook, the parameter RAM also holds your system sleep settings.

CHAPTER THIRTY

Printer Tips and Techniques

IN THIS CHAPTER

- Choosing the paper that produces the highest quality output
- Printing on card stock, transparency film, and even T-shirts
- Adding color to output produced by black-and-white printers
- Improving the performance of a PostScript printer
- Upgrading a printer — more fonts, more memory, more dots

A printer without paper is like a camera without film. And there are almost as many types of paper as there are types of film. Whether you use a dot-matrix printer such as Apple's ImageWriter II, an ink jet printer such as an Apple StyleWriter or Hewlett-Packard DeskWriter, or a laser printer such as one of Apple's LaserWriters, you'll find a wonderful variety of vehicles for your documents.

But the real fun begins when you explore the world of alternative print media. Peel-and-stick labels, Rolodex cards, mimeograph stencils, clear and colored plastic film, preprinted checks, and stiff card stock are among the paper alternatives most printers accept. You'll even find laser printer toner cartridges that enable you to create iron-on transfers for T-shirts, and products that add color to laser-printed documents. In short, printers aren't just for paper anymore. I begin this chapter with a look at the universe of paper, film, mimeo masters, and mailers that you can run through a printer, and end with a collection of tips for PostScript printers.

Today's Paper

Although the selection of alternative print media is growing, paper remains the preeminent output medium. Here are some tips for choosing the best stock for your printer and your print jobs.

ON THE CD

- Jim Lewis' theTypeBook utility

Paper for dot-matrix printers

For dot-matrix printers, ImageWriters and their ilk accept single sheets that you load as though loading a typewriter. The ImageWriter II accepts an optional sheet feeder that eliminates having to hand-feed page after page. A less-expensive alternative to hand-feeding is to use *fanfold,* also called *pin-fed,* paper. Fanfold paper is a single, long sheet of paper that's perforated and folded to lie in a stack. The left and right edges of the sheets have perforated strips containing holes that are grasped by sprockets in the printer.

After printing a document, you separate the sheets and tear off the perforated strips. This chore is sometimes called *bursting,* but "boring" is more accurate. To cleanly remove the perforated strips, fold them back and forth a few times before tearing; even then, many papers leave little nubs behind, each a dead giveaway that the document was printed on fanfold paper. To get cleaner edges, use a high-quality fanfold paper with finer perforations. Paper and computer supply houses often use terms such as *invisible perf* or *satin edge* to describe such stock.

Besides white and off-white colors such as ivory and gray, fanfold paper comes printed with horizontal green or blue bars — that classic computer paper look. The alternating bars of color and white supposedly help lead the eyes across lines of numbers.

You'll also find fanfold paper whose sheets are prepunched to fit in standard three-ring binders. And Lyben Computer Systems of Troy, MI is one source for Banner Band, 45-foot long rolls of paper with perforated sprocket edges, but no cross perforations. Available in several colors, it teams up well with Brøderbund Software's BannerMania program.

Printing with impact

One advantage dot-matrix printers have over ink jet printers and laser printers is that they're *impact* printers, and can print on the carbonless multipart paper that businesses depend on for invoices and other forms. Most supply houses sell blank multipart forms; you can also buy forms printed with your company name and logo from mail-order business form houses such as New England Business Services (800-225-6380).

Because dot-matrix printers are impact printers, you can also use them to create stencils for mimeograph machines. AB Dick's 2060 stencil masters are designed specifically for dot-matrix printers. You can also use AB Dick's less-expensive F-1960 masters if you remove their plastic backing before printing. (Use an old ribbon when printing the masters to avoid gumming up the ImageWriter's print head with stencil wax.) You'll get better mimeos if you avoid printing solid black or dark patterns on the masters.

Paper for laser printers

Laser printers use photocopier-like mechanisms, so any paper designed to run through copiers gives satisfactory results. Like fanfold paper, photocopier bond is available prepunched for three-ring binders.

When you want more than just satisfactory results, use a paper such as Hammermill's Laser Plus, CG Graphic Arts Supply's Laseredge series, or Georgia Pacific's Nekoosa Laser 1000. Available through most large office supply outlets, these papers' smooth, bright-white finish makes them ideal for printing camera-ready documents you'll supply to a print shop. If you use wax or spray adhesive to mount the output, use Hammermill's Laser Plus, which contains a coating, called a *wax holdout*, that enables the wax to adhere without soaking into the paper.

Specialty laser papers

Premium typewriter bond such as Eaton's 28-pound Impressions series delivers fine results in most laser printers. And if you're feeling green, you'll be glad to know recycled paper is available for dot-matrix and laser printers. Many office supply stores and mail-order houses sell recycled fanfold paper in white or with green bars. And Paper Direct (800-272-7377) sells a large selection of white, colored, and special-finish recycled stocks.

QUICK TIPS

Feeding without Fuss

Buying exotic paper is one thing; getting it to run through a printer without jamming is another. Most laser printers can automatically feed paper weights ranging from 16 to 28 pounds. (Most photocopier bond is 20-pound stock; the measurement refers to the weight of 500 sheets, or a ream, of 17 by 22-inch paper.) To print on heavier stocks, use the manual feed slot, which provides a straighter and therefore, less jam-prone, paper path. Check your printer's manual to determine its paper-handling limits.

Unless you've bought an optional envelope cassette, you'll also want to use the manual feed slot to print envelopes. Check your printer's manual for details on the margin settings you need to use, or just experiment. After you find the settings that work for you, save them in a template or stationery document that you can reuse. Electronic address book programs such as Portfolio Systems' DynoDex also have features that simplify envelope printing. Microsoft Word comes with a large selection of envelope stationery documents.

A staggering selection of specialty papers is available for laser printers, and the best source I've found for it is Paper Direct. Its mail-order catalog lists speckled granite, parchment, linen, and marble finishes along with pinstripes and borders. The Electrix and Firebrites series come in vibrant fluorescent and Day-Glo colors. The Perfs and Scores collection comprises several types of perforated or scored stocks. One is scored so that it folds three times, and has a perforated area that makes an ideal tear-off reply card. Another is similarly scored, but contains a perforated Rolodex card. Still another has a slot for a business card. They're an economical way for a small business to produce expensive-looking brochures. Lyben Computer Systems stocks colored and textured specialty paper manufactured by The Legacy Company. Letraset's Copy FX collection also sports several specialty stocks.

Paper for the ink jet set

Ink jet printers are finicky about paper. The paper you use must be absorbent enough to enable the ink to dry without smearing. But if the paper is too absorbent, the ink seeps into its fibers, giving the output a ragged-edged look. Some photocopier bonds work well, but others absorb better than a paper towel.

Because ink jets are also vulnerable to variations in room temperature and humidity, the best way to find the ideal paper is to experiment in the room where you'll be printing. When you find a paper that works well, stock up. Many DeskWriter users swear by 24-pound Classic Crest in the Solar White color (catalog number 04631). Apple recommends the same paper for its StyleWriter. Other DeskWriter users report good results from Pro-Tech Laser Bond White (catalog number 94161), and from James River Corporation (800-521-5035).

QUICK TIPS

Which End Is Up?

Regardless of the paper you choose, you'll get better results if you print on the correct side. Because of the way paper is made, each side of a sheet has different characteristics. The correct side to use for printing is the *felt* side, which is smoother than the *wire* side. Most paper manufacturers indicate the felt side on the label attached to the paper's wrapper. If you've removed the paper from its wrapper (a bad idea, because it exposes the paper to humidity), you'll need to print some tests. The side that gives the sharpest results is the felt side. If you're using watermarked bond, hold a sheet up to the light: If the watermark's text or design is reversed, you're looking at the wire side. (This felt-versus-wire side issue applies to laser printing, too, but print quality doesn't degrade as dramatically if you laser-print on the wire side.)

Another problem with ink jet output is that it can smear, especially if it gets wet. StyleWriter output is more prone to smearing than that of an HP DeskWriter. Graphic Utilities (800-669-GRAF) sells StyleWriter ink cartridges and cartridge refilling kits that the firm says makes StyleWriter output less smear-prone (several colors are available). Remember, you can always eliminate smear fears (and improve contrast) by photocopying ink jet output. To protect the address on an envelope from smearing, cover the address with a piece of tape.

See-Through and Label Output

Businesses and schools rely on overhead transparencies for presentations and instruction. Transparency film also makes attractive, see-through covers for reports. And, as I'll describe shortly, it teams up well with peel-and-stick labels.

The only transparency film designed for dot-matrix printers I've found is 3M's Type 186 Impact Dot-matrix Transparency Film (order number 78-6969-6505-8). For HP DeskWriters, use Avery's 5277 transparency film. For StyleWriters, Apple recommends 3M CG3480 film. And for laser printers, there's 3M's Type 154 Laser Printer Transparency Film (order number 78-6969-6085-1) and Avery's ColorFrames film, which has colored borders in a variety of hues. James River's ProTech line also has transparency film in several colors.

If you plan to reuse transparencies, consider mounting them in cardboard frames such as 3M's Type 9070 Transparency Mounting Frames. Frames eliminate distracting light leaks around the transparency's edges, they make transparencies easier to handle and sort, and they provide an area where you can write notes. The Image Frame also protects the transparency with a layer of clear plastic that you can write on and erase, and it's prepunched for storage in three-ring binders.

Output with a peel

Peel-and-stick labels have a thousand-and-one uses, and nearly as many varieties are available for all types of printers. Avery's selection is the largest, with everything from mailing labels to audio and video tape labels. Most labels are white paper, but several clear plastic sizes are available for laser printers. Their matte finish, similar to that of Scotch Magic Transparent Tape, makes the label stock nearly invisible when applied.

Avery labels have become so popular that many programs — including Aldus PageMaker, Claris FileMaker Pro, and Microsoft Word and Works — include template documents designed for the most common sizes. Simply open one of these templates and substitute its placeholder text with your own, and then load up the printer and go.

QUICK TIPS

Creating Laminated Cards

By combining transparency film with full-sheet label stock such as Avery's 5353, you can create rugged laminated plastic cards. After laying out the card, choose the Page Setup command and click the Options button. In the Options dialog box, check the Flip Horizontal box, and then click OK. (Note that only the LaserWriter's Page Setup command offers the Flip Horizontal option. If you have a different printer, you'll need to use a page-layout or graphics program that has its own Flip Horizontal command or mirroring function. Most drawing and painting programs do, although in some — including Claris MacDraw II — the function works with graphics only, not text.

Next, print the document on the transparency film. Attach the label stock to the film, with the toner side (the side whose contents appear backwards) facing the stock, and then trim. Because the toner is sandwiched between the label and film, it won't scratch off.

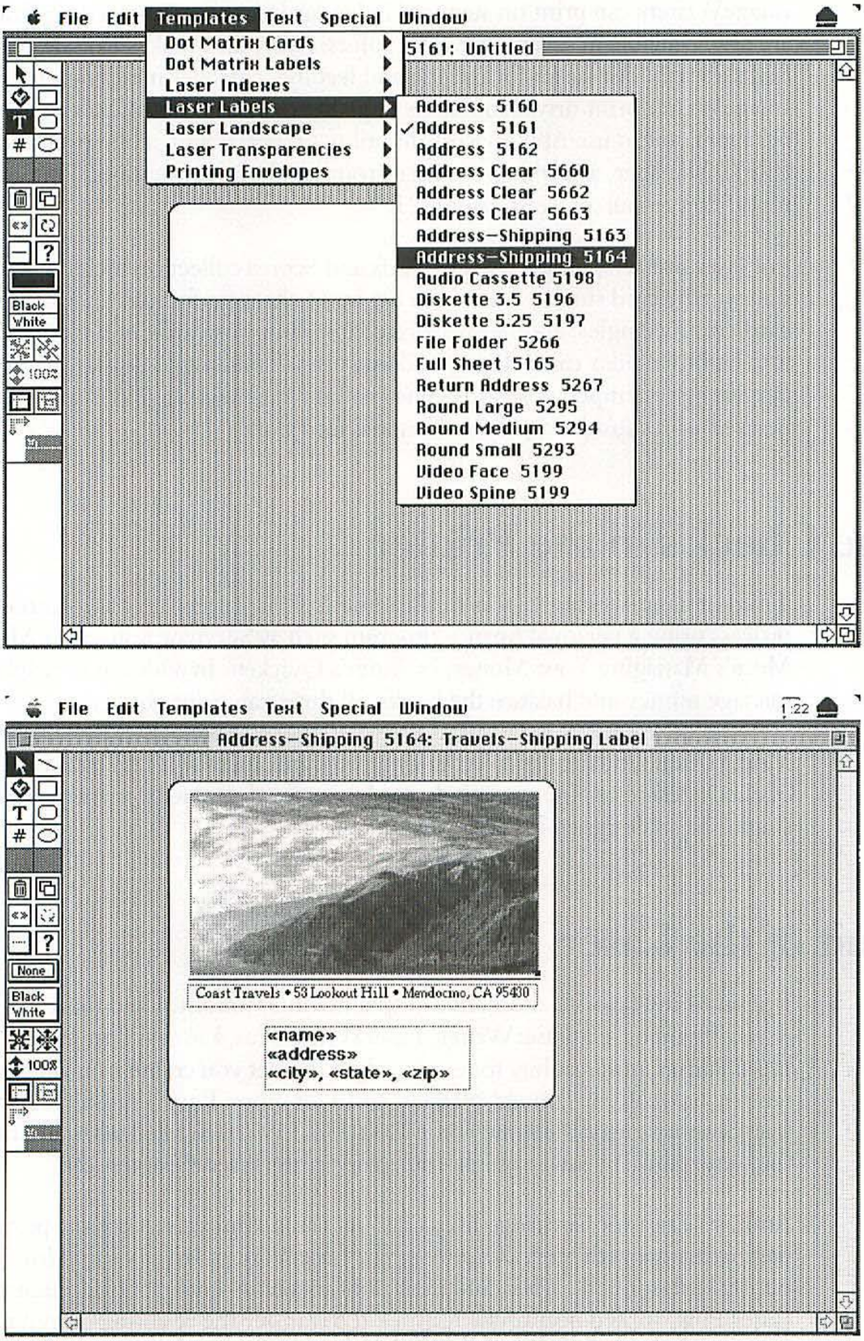
The easiest way to print on Avery labels is to use Avery's own MacLabelPro software. MacLabelPro is essentially a bare-bones publishing program that includes templates for every label stock in Avery's line (see Figure 30-1 "Easy Labels"). But it also sports some unique talents, such as the ability to print a different serial number on each label. And its powerful print merge feature lets you print labels containing data from a database file.

Printers for labels

If you print loads of labels, consider Costar's LabelWriter II, a tiny printer that prints just labels. (The LabelWriter II Plus prints larger labels.) Costar also makes the AddressWriter and the larger AddressExpress, both of which print envelopes, postcards, and pinfeed labels.

Card Games

Database programs such as FileMaker Pro haven't completely replaced index cards and Rolodex files. In fact, by printing a database on card stock, you can have the best of both worlds — electronic sorting and revision along with the portability of hard copy.



Coast Travels • 53 Lookout Hill • Mendocino, CA 95430

«name»
«address»
«city», «state», «zip»

Figure 30-1: Easy Labels Avery's MacLabelPro simplifies printing on Avery labels by combining basic page-layout features with predefined templates for most Avery label stocks.

ImageWriters can print on standard index cards; continuous-feeding fanfold cards are also available in several sizes and colors. Avery also makes Rolodex cards in fanfold form. For easier formatting and feeding, consider modifying the ImageWriter print driver so that its Page Setup dialog box offers an index card option. You can use Apple's ResEdit utility or, better still, a free program called PREC Manager, available from user groups and on-line services. For details on modifying resources, see Chapter 23.

For laser printers, Paper Direct's Perfs and Scores collection includes several noteworthy card stocks. There's an 8½ by 11 sheet perforated into eight business card-size rectangles, another perforated into four postcards, and a third divided into eight Rolodex cards. If you're doing a small mailing, consider the Postal Service's prestamped postcards. They roll through an ImageWriter well, and can be used with most laser printers' manual feed slots.

The Check's in the Printer

Tired of hand-writing checks to the same creditors every month? Automate the process using a personal finance program such as Survivor Software's MacMoney, Meca's Managing Your Money, or Intuit's Quicken. In addition to helping you manage money and balance the books, all three can print checks.

Most personal finance and accounting programs include a catalog listing a variety of check designs; some come in fanfold form for dot-matrix printers, others are single sheets designed for lasers and ink jets.

Fruit of the Laser

I've saved my favorite alternative output medium for last. I had to: It was in the dryer. If you have a LaserWriter, LaserWriter Plus, LaserWriter II, or Personal LaserWriter, you can buy toner cartridges that let you create iron-on transfers for fabrics, baseball caps, mugs, plaques, and a lot more. Easy Transfer Cartridges, from a company of the same name (800-336-1599), are filled with sublimation dye, the same pigment used in high-end color printers (see Chapter 32).

An Easy Transfer Cartridge lives up to its name. Simply replace the printer's standard cartridge with an ETC, choose the LaserWriter driver's Flip Horizontal option as described earlier, and then print to a high-quality stock (Hammermill's Laser Plus worked beautifully for me). To transfer the resulting output to fabric, a household iron on its cotton or linen setting works well, although you can blur large transfers if you move the iron too quickly. The company recommends using a dry mounting press (most school graphic arts and photography departments have them). The first ETC cartridges required you to use fabric composed of at least 50 percent polyester, lest the transfer come out in the wash. Fortunately for cotton lovers, the latest ETC cartridges work with all-cotton fabrics, too.

Creating color transfers

If you're adventuresome — and you have a graphics program that does color separations (Aldus FreeHand and Adobe Illustrator do) — you can print full-color images by printing them in four passes, once each for a cyan, magenta, yellow, and black cartridge. Obtaining accurate registration (ensuring that each color prints in the correct place) for each pass is difficult, however.

ETC cartridges are available in a rainbow of colors. A sample transfer, and literature that lists compatible surfaces, is free. Currently, ETC cartridges are available only for printers built around Canon's CX, SX, and LX engines. That means they'll work in Apple's original LaserWriter and LaserWriter Plus, the LaserWriter II series, and the Personal LaserWriter series. Dozens of third-party printers use the same engines: If you're not sure which engine your printer uses, check with ETC.

Finishing Touches

The cliché notwithstanding, books *are* often judged by their covers. To add appeal to laser-printed or photocopied documents, you can add color using Letraset's Color Tag system, a wallet-sized electric iron and heat-sensitive colored foil. Place the foil over the part of a document to be colorized, and burnish it with the iron. When you peel off the foil, the color adheres to the toner that the printer or copier applied. The foil comes in 72 colors and in metallic and matte finishes. The results are stunning.

The best way to enhance and present a large document is to bind it. VeloBind Corporation manufactures binding equipment of all sizes, from the Personal VeloBinder, which binds up to 45 pages, to the Model 750, which joins up to 750. The firm also sells attractive cover stocks and tab dividers. Bind-it Corporation's Covermate 600 is a thermal binding machine that produces *perfect-bound* books of up to 2 ¼ inches wide. (This book, like most, is perfect bound.) Bind-it's Covermate 25 uses less-expensive plastic-comb binding.

I've covered the most popular kinds of print media here, but there isn't room to describe every kind of specialty paper and output accessory. Paper Direct sells a sampler kit containing hundreds of paper and envelope samples, and the price is credited to your first order. And most office supply stores stock a large selection of labels, paper, and binding equipment. Try them out. Classy papers and alternative output media are more tools you can use to convey your messages — and they're a fun way to give your printer a break from the same old stock.

Tips for PostScript Printers

If you use a laser printer in an office, chances are it's a PostScript printer. Some non-PostScript laser printers are available for the Mac — examples include GCC's PLP series and Apple's Personal LaserWriter LS and LaserWriter Select 300 — but PostScript printers' superiority for graphics and publishing work and their ability to be easily shared on a network have made them the preferred printers in the Macintosh business world.

Since Apple's original LaserWriter appeared in 1985, I've worked with well over 100 PostScript printers in the course of writing *Macworld*'s printer roundups. In this section, I present a collection of PostScript printer tips and techniques for improving performance, managing fonts, and upgrading your printer. The following tips also apply to color PostScript printers.

No start-up page

I'll start with an easy one. When you switch on a PostScript printer, it ruminates for a minute or two and then prints a *start-up page* listing information about the printer: the number of pages it has printed, the fonts it contains, and the settings of its various ports. Occasionally, these statistics are useful, but most of the time, the start-up page just wastes time, toner, and paper.

You can disable the start-up page in a few ways. The low-tech solution involves simply pulling the printer's paper tray out an inch or two when you first switch it on. When the printer's on-line indicator illuminates, indicating the machine is warmed up and ready for print jobs, slide the tray back into place.

A better method is to explicitly tell the printer to stop printing its start-up page. Most of today's PostScript printers sport calculator-like keypads you can use to adjust various settings — including whether a start-up page is printed.

If your printer doesn't have a keypad (none of Apple's do), you need to run a utility program on your Mac to disable the start-up page. Apple's PostScript printers include a utility called LaserWriter Utility; if you have a non-Apple PostScript printer, you may be able to obtain a copy from an Apple dealer. An older, less-capable program called LaserWriter Font Utility is included on the System 7.1 Tidbits disk and is also widely available through on-line services and user groups. Both programs have a Utilities menu containing a command called Start Page that lets you enable or disable the start-up page.

QUICK TIPS

Utilities for Power Printing

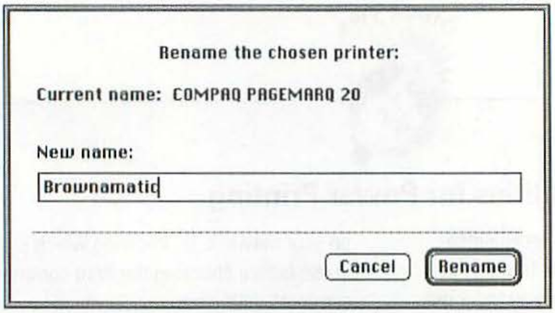
Numerous utilities are available that can enhance your printer's operation, make it easier to manage printers on a network, or just cut down on toner use. Here are some examples.

- *Print Central* This network utility from Compumation lets you set up a centralized print server on a dedicated Macintosh. Print Central sports numerous options that streamline printing in a busy office, such as the ability to route print jobs to whichever printer is least busy. You can also specify security options to keep some printers (such as your color machine) off limits to certain users (like the guy who keeps printing scanned images of his kids).
- *Blue Parrot* This control panel from Casa Blanca Works lets you monitor the status of the printers on your network. By knowing which printers are in use before choosing the Print command, you can route your job to an idle machine — or at least to one with a smaller number of pending jobs.
- *ShadowWriter* This utility from Gizmo Technologies lets you share a printer on a LocalTalk network that wasn't designed for sharing, such as the Personal LaserWriter LS or original StyleWriter.
- *Toner Tuner* This clever utility from Working Software adds a slider to the Print dialog box that lets you save laser printer toner by adjusting the darkness of output.

Name that printer

When you use the Chooser desk accessory to select a PostScript printer, the printer's name appears in the Chooser's device list. Usually, the name corresponds to the printer's model number — *LaserWriter Pro 630,* for example. With the aforementioned LaserWriter Utility's Printer Name command, you can change the name to something more descriptive — *Art Department Printer* or *5th Floor LaserWriter* or *Trixie's Printer* or *Lil' Gutenberg* (see Figure 30-2 "What's in a Printer Name?"). Naming a printer is especially valuable if your network contains two or more printers of the same model, a situation that can make it impossible to tell which printer in the Chooser is which.

If you can't round up LaserWriter Utility, check the disks that came with your printer. An older Apple utility called The Namer also lets you change a printer's name.



Rename the chosen printer:

Current name: COMPAQ PAGEMARQ 20

New name:

Brownamatic

Figure 30-2: What's in a Printer Name? With the LaserWriter Utility's Printer Name command, you can change a PostScript printer's name.

Font Downloading Strategies

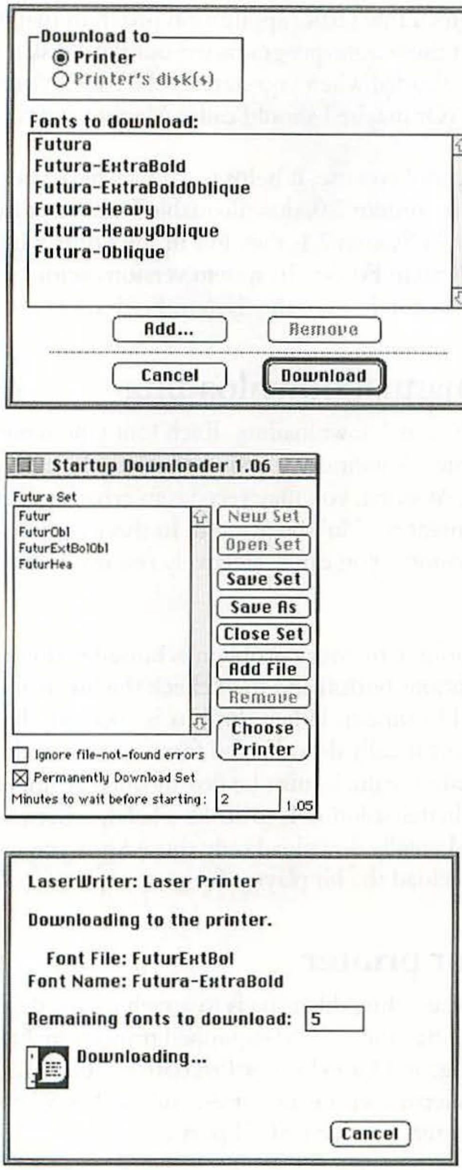
You probably already know that you can supplement the fonts built into a PostScript printer with *downloadable* fonts — ones that reside on your Mac's hard disk and are transferred to the printer's memory. (If you didn't know that, you can find more details in Chapter 32.) When you print a document, the Mac's PostScript printer driver — the system file named LaserWriter — queries the printer to determine if it contains the required fonts. If it doesn't, the driver automatically downloads the fonts, and then clears them from the printer's memory at the end of the job.

Automatic downloading is convenient, but there's a catch: One downloadable font takes up to 20 seconds to transfer over the LocalTalk cabling you probably use. If you use a few downloadable fonts — say, New Baskerville with italic and bold — you add a minute to the time required to print a document. And if you print a document a few times in the course of fine-tuning its formatting, the wasted time piles up even more.

Downloading by hand

One answer is manual downloading. By taking the time to download "by hand" the fonts you plan to use, you remove the need for automatic downloading during print jobs. Fonts downloaded manually remain in the printer's memory until you nix the power or reset the printer.

You can download fonts using LaserWriter Utility or its older sibling (see Figure 30-3 "Downloading Fonts Manually"). A more-convenient option is a $20 shareware control panel called Startup Downloader, by Manuel Veloso. With Startup Downloader, you specify sets of fonts that you want to manually download.



Download to
● Printer
○ Printer's disk(s)

Fonts to download:
Futura
Futura-ExtraBold
Futura-ExtraBoldOblique
Futura-Heavy
Futura-HeavyOblique
Futura-Oblique

Startup Downloader 1.06

Futura Set
Futur
FuturObl
FuturExtBolObl
FuturHea

☐ Ignore file-not-found errors
☒ Permanently Download Set
Minutes to wait before starting: 2
1.05

LaserWriter: Laser Printer

Downloading to the printer.

Font File: FuturExtBol
Font Name: Futura-ExtraBold

Remaining fonts to download: 5

Downloading...

Figure 30-3: Downloading Fonts Manually You can download fonts manually with a utility such as Apple's LaserWriter Font Utility or the newer LaserWriter Utility (top), which here shows a list of fonts selected for downloading. Manuel Veloso's shareware Startup Downloader control panel (bottom) creates tiny application programs that download sets of fonts when run.

Startup Downloader then creates a tiny (20K) application program that, when run, downloads the fonts. If you put these mini-programs in your hard disk's Startup Items folder, the fonts are downloaded when you start up the Mac. It's manual downloading made automatic. (Or maybe I should call it Manuel downloading.)

Regardless of the downloading tool you use, it helps to know where your downloadable font files are located. In System 7.0, downloadable PostScript fonts are stored in the Extensions folder; in System 7.1, they live in the Fonts folder. Both folders are located within the System Folder. In system versions prior to 7.0, PostScript fonts reside within the top level of the System Folder.

The down side to manual downloading

There are some drawbacks to manual downloading. Each font you manually download leaves less room in the printer's memory for fonts that may be automatically downloaded during print jobs. At worst, you may receive an error message during a print job stating that the document couldn't be printed. In this case, you need to reset the printer to clear its memory: You can't selectively remove fonts that you've manually downloaded.

One possible solution to this printer-memory problem is buried within the Page Setup dialog box: Click the Options button and then check the box named Unlimited Downloadable Fonts in a Document. When this box is checked, the LaserWriter driver purges automatically downloaded fonts as soon as they're used. However, if a given font is needed again, it must be downloaded again, lengthening print times. For this reason, a better solution is to strike a balance between manual and automatic downloading: Manually download only those fonts you use most and let the LaserWriter driver download the bit players for you.

A hard drive for your printer

The best alternative to the downloading dilemma is to attach a hard disk to your printer's SCSI port — if it has one. Some SCSI-equipped printers include Apple's LaserWriter IINTX, IIf and IIg, and LaserWriter Pro 630; GCC's BLP II and BLP IIs; Texas Instruments' microLaser Turbo series; and NEC's SilentWriter2 990. Most color PostScript printers also have SCSI ports.

When you attach a hard drive to a printer, you can use a font-downloading utility to download fonts to the drive. Then, when the fonts are required during a print job, the printer transfers them from its hard drive to its memory — almost instantly. A hard drive also makes a PostScript printer faster at printing documents containing a large variety of fonts, sizes, or styles. If you're desperate for storage space, you can delete the printer font files from your Mac's hard drive, thereby reclaiming some precious storage space. Note, however, that if you use the Adobe Type Manager (ATM) utility, deleting the printer font files will prevent ATM from generating sharp screen characters at any size. If you work primarily with small text sizes, this drawback won't be significant. If you create a lot of display type, though, you may want to leave the printer fonts on your hard disk.

Note that some hard drives can't be formatted as font drives. If you're buying a drive to attach to a PostScript printer, verify with its manufacturer that it can work with one.

If your printer lacks a SCSI port, you can still boost its capacity for downloadable fonts by adding a memory upgrade or font card to the printer (see the Background box "Hardware Upgrade Options").

Hardware Upgrade Options

Hardware upgrade options vary from printer to printer — some machines accept second paper trays or envelope feeders, for example. But some upgrade categories apply to most or all PostScript printers.

Memory

Most PostScript printers accept memory upgrades. Adding more memory increases the printer's downloadable-font capacity and boosts its overall performance, particularly with graphically complex documents. With some printers, adding memory also increases the printer's *image area,* and thus lets you print closer to the edges of the page. With low-end printers such as Texas Instruments' microLaser PS17, you must add memory in order to print legal-size (8 ½ by 14-inch) pages. (Another way to increase the image area is to click the Page Setup dialog box's Options button and then check the Larger Print Area box. This slows printing and leaves less room for downloadable fonts, however.) Some printers even provide better output quality when equipped with more RAM. Boost an Apple LaserWriter IIf's memory to at least 5MB, and you can take advantage of its PhotoGrade technology to print better-looking scanned images. Boost an IBM/Lexmark LaserPrinter 4019 to 5MB, and its resolution jumps from 300 dots per inch to 600 dpi.

Font cartridges

Apple's now-discontinued LaserWriter IINTX contains an internal slot that accepts a circuit board containing additional fonts. Other printers — including numerous models from QMS, Texas Instruments, Okidata, and IBM/Lexmark — provide front-panel slots that hold font cartridges. Fonts in a font cartridge don't have to be downloaded; besides boosting the printer's performance, this frees more of its RAM for lesser-used downloadable fonts, and it reduces data traffic on your network.

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The best source for font cartridges is Sonnet Technologies, whose FontCards sell for between $199 and $249 and contain between 10 and 18 Adobe typefaces. Sonnet will also create customized cartridges containing the fonts you use most, including any custom fonts you may have created using programs such as Altsys Fontographer.

Controller upgrades

Xante Corporation sells numerous hardware upgrades for Apple's original LaserWriter, for the LaserWriter II series, and for other popular printers from Hewlett-Packard, Canon, QMS, and others. Xante's AccelaWriter series boosts resolution to 600 dpi and provides faster performance as well as SCSI ports for hard disks. Xante's upgrades (along with the firm's laser printers) also sport an innovative feature called Virtual Disk Technology that enables you to permanently download fonts to the printer. The ImageUp! board from NewGen Systems provides similar benefits (sans the Virtual Disk Technology) for HP LaserJet series II printers.

Sharing downloadable fonts on a network

Downloadable font files use roughly 50K of disk space apiece. Twelve downloadable font files — that's only three font families, assuming four fonts per family — can easily eat up half a megabyte of disk space. If you have a large downloadable font library and multiple Macs on a network, you're probably wasting a lot of hard disk space by storing the same font files on each Mac's hard drive. (Note my caveat about Adobe Type Manager, earlier in this chapter.)

Attaching a hard drive to your printer is one solution to this problem. A less-expensive answer involves combining a font-management utility — either Fifth Generation Systems' Suitcase or ALSoft's MasterJuggler — with System 7's built-in file sharing features or with a file-server program such as Apple's AppleShare.

First, determine which Mac will be the file server (or in this case, the font server), and then copy to its hard drive all your printer fonts and at least one suitcase file. (A suitcase file holds screen fonts — those bitmap versions of the outline fonts PostScript printers rely on. You can create suitcase files using Apple's Font/DA Mover utility, a System 7-compatible copy of which is included with Suitcase. If you don't have Font/DA Mover, copy one of the suitcase files on the System 7 Fonts disk to your hard disk, and then open its icon and remove the fonts inside. Then, copy the screen fonts into this "empty suitcase.") Be sure both the printer fonts and the screen fonts are located within the same folder (see Figure 30-4 "Font Server Setup").

If you want to store a large number of screen fonts on the server, consider combining them into logically packed suitcase files. You might pack suitcases according to project — all the fonts for the company newsletter, for the training manual, and so on — or you might simply pack them according to their family — all Futura fonts in one suitcase, all Garamond fonts in another, and so on.

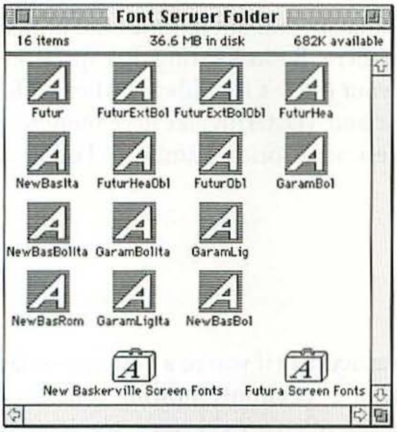


Figure 30-4: Font Server Setup To set up a font server for use with Suitcase or MasterJuggler, move the printer font files to a shared folder containing one or more suitcase files. (Adobe printer font files are shown here; other firms' printer fonts have different icons.) Then, connect to the shared folder and open one or more of its suitcase files.

Warning: Although it's OK to rename a suitcase file, you should never rename a printer font file. If you do, the LaserWriter driver will be unable to automatically download that font.

After you've copied all the screen and printer fonts to the font server, you can delete them from the other Macs' hard drives. Finally, make the font server's hard drive available to the other Macs on your network by using System 7's Sharing Setup control panel or by running the AppleShare application. (See Chapter 23 for more details on setting up System 7's file sharing.)

Now install a copy of Suitcase or MasterJuggler on each Mac. (Legally, you must buy a copy for each machine.) Use each machine's Chooser desk accessory to connect to the shared hard drive, and then open Suitcase or MasterJuggler and use its Open command to open the desired font suitcases on the shared hard disk. (You need open only one suitcase file in order for the Mac to be able to find all the printer font files.) Chances are you'll want multiple users to be able to open a given suitcase. If so, in Suitcase, check the Shared box before opening a given font suitcase. If you use MasterJuggler, you need to configure the server's access privileges so that the folder containing the fonts does not enable users to make changes.

Setting up a font server requires an initial investment in time (and probably troubleshooting), but the rewards are there. Besides saving disk space on each user's machine, it's easier to manage your office's font library when all fonts are stored in one place. And both Suitcase and MasterJuggler have numerous features that streamline working with fonts, desk accessories, sounds, and other system resources.

Printing Font Samples

If you have a large font library, and particularly if you're a designer or layout artist, you may want to assemble a font catalog — printouts showing your fonts in various point sizes and styles. Typesetting houses often provide type-specimen books to their clients to aid them in choosing fonts. In my previous life as a typesetter, I spent hundreds of hours typesetting these font fashion shows.

More Quick Printer Tips

Here are a few more quick tips for PostScript printers.

Manually download frequently-used fonts
I've spent much of this chapter on this tip, but it's worth repeating. There isn't a better way to inexpensively improve performance with downloadable fonts.

Don't use city name fonts like New York or Geneva
Besides looking inferior to true PostScript fonts, these fonts require the printer to perform additional calculations that slow performance.

Use the Print dialog box's Black & White option
If you're proofing a page with color or grayscale images, you'll see it sooner by choosing the Black & White option. (In the new Apple/Adobe driver, click the Print dialog box's Options button and then choose Black and White from the Print pop-up menu.)

Uncheck Larger Print Area or Unlimited Downloadable Fonts
They slow the printer by commandeering printer memory that would otherwise be used to handle the calculations required to print a page.

Avoid mixing a slew of fonts, sizes, and styles
This is the best way to boost a PostScript printer's performance. And not only will you see your pages faster, but the pages you see will look better.

With Jim Lewis's theTypeBook, a free utility available through user groups and on-line services (and on the *Macworld Complete Mac CD*), creating font catalogs is as easy as choosing a few commands. theTypeBook can print font samples in six different formats, including charts showing which key sequences summon special characters. For a small fee, Jim Lewis will create a customized version of theTypeBook that prints a company name and logo on each page. It's a great way for a small graphics shop or freelancer to create a professional-looking type specimen book.

Improving Your Driving

I've mentioned the LaserWriter driver file a few times: It's the link between your Mac and a PostScript printer. Over the years, Apple has released numerous updates to the LaserWriter driver.

A significant new version of the driver, the result of a collaboration between Apple and Adobe Systems, is now available. If you buy an Apple printer, you receive a driver called LaserWriter 8.0. If you buy a non-Apple printer, you receive a driver named PSPrinter. Whatever its name, its primary benefits are the same: It's faster and provides direct access to specialized paper-handling features your printer may provide. For example, if you have a printer with two paper trays (or even one paper tray and a manual feed slot), you can specify that the first page of a document be printed from one tray and that subsequent pages be printed from the other — great for business correspondence that uses letterhead and second sheets.

The new driver also provides better support for the enhanced printing capabilities of PostScript Level 2, the version of PostScript built into most of today's monochrome laser printers and into a growing number of color machines. The new driver can also print up to four reduced-size pages on a single sheet of paper — handy for proofing purposes.

CHAPTER 30 CONCEPTS AND TERMS

- Office supply stores and specialty mail-order houses such as Paper Direct are great sources for special paper stocks, transparency film, peel-and-stick labels, and other print media.
- ImageWriters and other dot-matrix printers are impact printers; unlike ink jet and laser printers, dot-matrix printers can print on carbon and carbonless multipart business forms.
- For ink jet printers, you get the sharpest output by using smooth paper and printing on the proper side.
- When you want top quality from a laser printer, use an ultra-smooth laser paper such as Hammermill's Laser Print or Laser Plus.
- You can print iron-on transfers for T-shirts and other fabrics using Easy Transfer Cartridges.
- Techniques for improving a PostScript printer's performance include disabling the start-up page, manually downloading often-used fonts, attaching a hard disk to the printer if it supports one, and expanding the printer's memory.

downloadable font
A font that resides on your Mac's hard disk and is transferred to the printer's memory.

fanfold paper
Also called *pin-fed* paper, a single, long sheet of paper that's perforated and folded to lie in a stack. The left and right edges of the sheets have perforated strips containing holes that are grasped by sprockets in the printer. After printing a document, you separate the sheets and tear off the perforated strips.

felt side
Also called the *top side,* the smoother side of a sheet of paper — and the side you should print on, particularly if you have an ink jet printer. Compare with *wire side.*

image area
The area of a page that a printer can actually produce output on. Most laser printers, for example, can print to within roughly a quarter of an inch of the edges of the page. You can increase the image area by checking the Larger Print Area option in the Page Setup dialog box's Options dialog box.

impact printer
A printer that produces output in the manner of a typewriter — by striking a ribbon that transfers ink to the paper. Nonimpact printers include ink jet and laser printers.

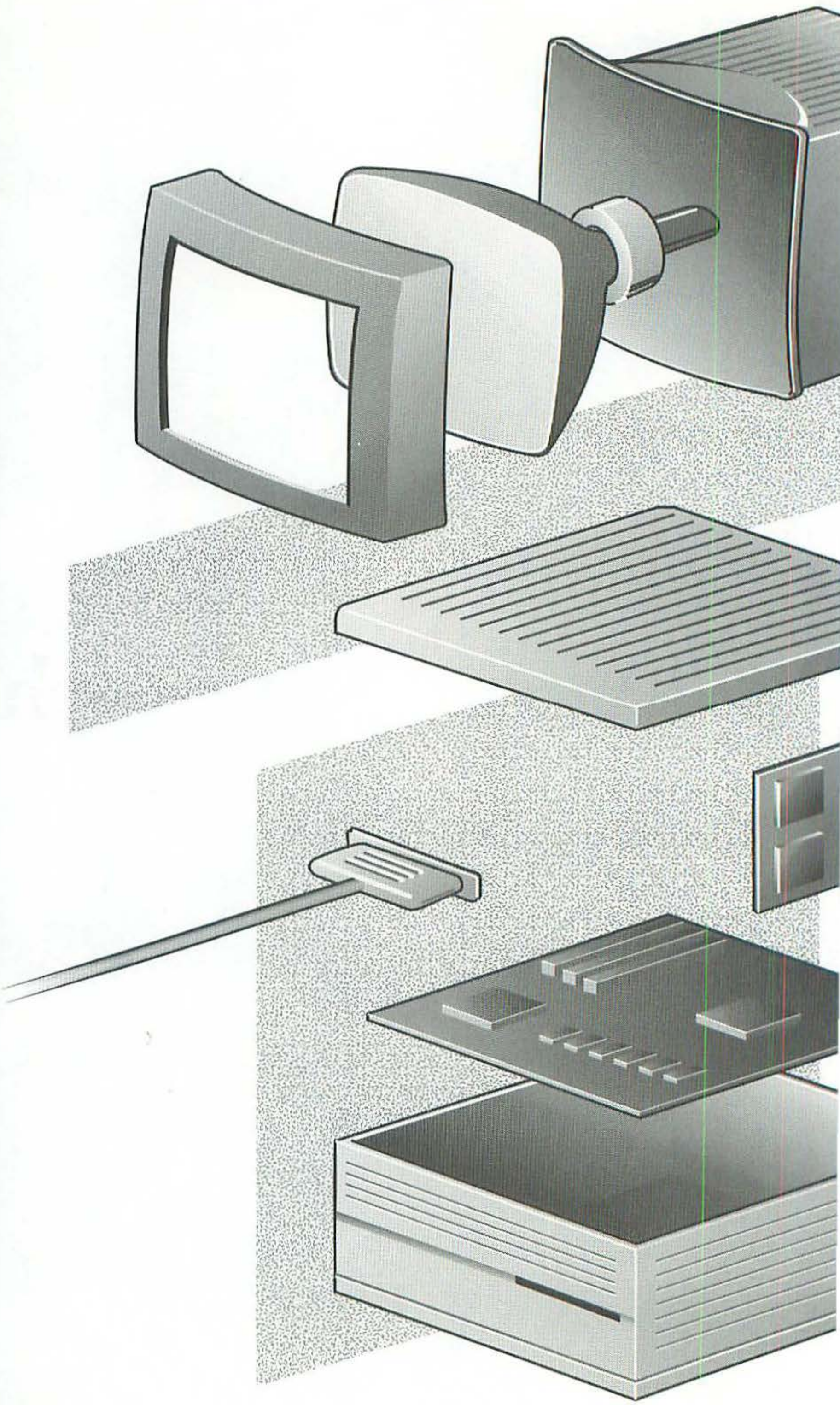
ream
500 sheets of paper.

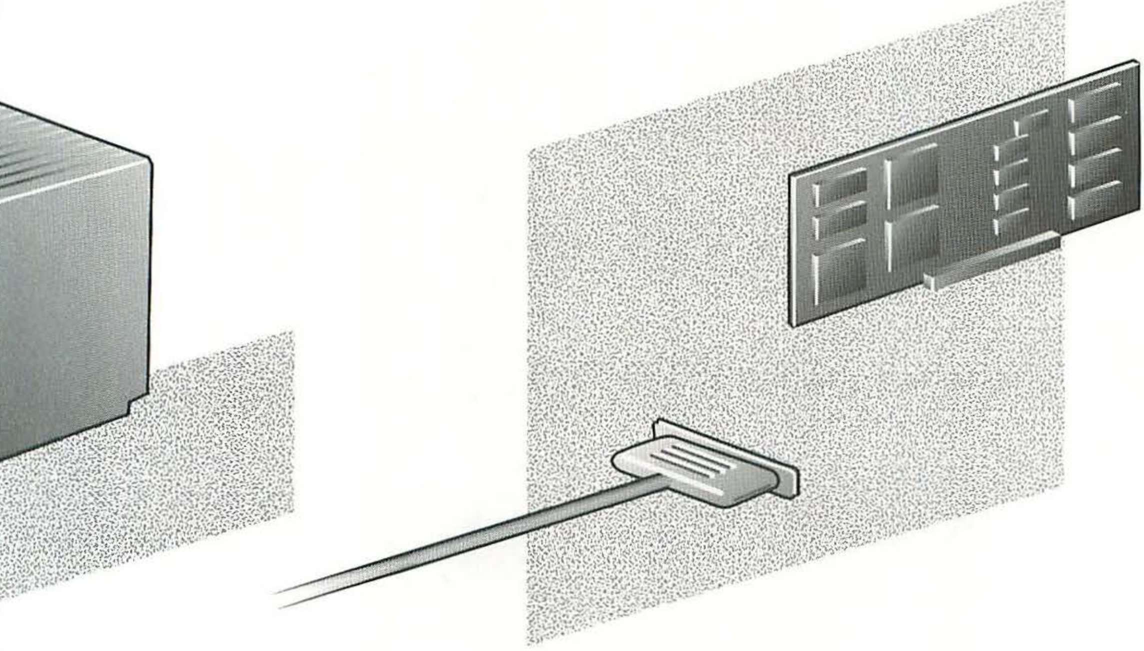
sheet feeder
An add-on, available for ImageWriters and some ink jet printers, that holds a stack of paper, eliminating having to hand-feed page after page.

start-up page
A page printed by a PostScript printer shortly after it's switched on, listing information about the printer — the number of pages it has printed, the fonts it contains, and the settings of its various ports.

wire side
The rougher side of a sheet of paper, the wire side is the side that is in contact with the paper manufacturing equipment's wire brushes. If you print on the wire side using an ink jet printer, your output is likely to look somewhat splotchy. Compare with *felt side.*

PART III





Expanding the Mac

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CHAPTER THIRTY-ONE

Upgrading Strategies

IN THIS CHAPTER

- Assessing the hardware upgrade options for each Mac
- Surveying PowerBook upgrades
- Improving your Mac's video features
- Understanding and installing memory upgrades
- Deciding between an upgrade or new Mac

Buying into the Mac world is like boarding a moving train. You stand alongside the tracks, waiting until the right model comes along, and then you time your leap and hold on as money flutters from your pockets. Whew — you made it.

But where are you heading? Toward a dead-end spur? Is a new model going to pass as you settle into your seat? And if this train can't take you to your destination, will you be able to transfer to one that can?

Every Mac owner has faced worries like these at one time or another — especially lately, with Apple turning out new Mac models every few months. Should you sell your old Mac and buy a new one? Will a third-party accelerator board or other upgrade suffice? Will your upgraded machine be compatible with today's Macs?

These aren't easy questions to answer, but one thing is certain: An old Mac may not be the newest or fastest train on the tracks, but it can still take many people where they want to go. (And it sure beats walking.) But more to the point, you can upgrade an old Mac to give it most of the features in Apple's current offerings. And if you do have one of the newest Macs, hardware upgrades can make a good thing even better.

In this chapter, I outline the most common upgrade options available for old and new Macs, with the goal of helping you map out an upgrade path that makes the most of your Mac and your money. I also provide some background into how the Mac's memory works and how the Mac creates its knock-out screen displays.

ON THE CD

- The Connectix Macintosh Memory Guide stack

Assessing Your Hardware Options

Before you can devise an upgrade strategy, it helps to know what your options are. Hardware upgrades fall into two broad categories — ones that make your Mac faster, and ones that add new features such as color or additional storage. The most common upgrades within these categories (which often overlap) are detailed in the following sections.

Memory

More memory helps programs run faster and enables you to run more of them at once. More memory also lets you create larger documents with programs that keep entire documents in memory instead of swapping between memory and disk. (Examples include drawing programs such as Deneba's Canvas and the Claris MacDraw series, spreadsheet programs such as Microsoft Excel, and integrated packages such as ClarisWorks.) I discuss memory upgrade issues in more detail later in this chapter.

Hard disks

All current (and many discontinued) Macs include an internal hard drive, but it tends to fill faster than a hall closet. The Mac's SCSI bus can accommodate multiple drives, however, and dozens of companies are eager to sell you one. See Chapter 26 for the scoop on storage.

Accelerator boards

These silicon brain transplants replace your Mac's *central processing unit* (CPU) with a faster, flashier one. Accelerators for the Mac Plus, SE, and Classic usually replace those machines' 68000 CPU with a 68030 — the CPU that drives the Color Classic, Classic II, LC II and LC III, and other mid-range Macs. Accelerators for the Mac II family usually replace the 68020 or 68030 with a 68040 — the brain behind the Centris and Quadra families.

Logic board upgrades

This upgrade involves an Apple dealer replacing your machine's main circuit board — its *logic board* — with a different one. Logic board upgrades are restricted to models that have cousins in the same basic case — you can upgrade a Classic to a Classic II; an LC or LC II to an LC III; a IIci or IIcx to a Quadra 700; a Centris 610 to a Centris 660AV; a Quadra 800 to a Quadra 840AV; a Quadra 900 to a Quadra 950; and a II and IIx to a IIfx.

Logic board upgrades generally cost more than accelerators, but they have a significant advantage: All logic board upgrades either include or require the purchase of new *read-only memory* (ROM) chips, which contain some of the Mac's fundamental system software. Thus, your Mac not only gets faster, it gets new features. The Classic-to-Classic II upgrade, for example, gives you Color QuickDraw, which opens the doors to color video boards. That particular upgrade will serve you well with System 7 too — especially if you want to use virtual memory (see the Background box "System 7 and Upgrades").

Video upgrades

Most Macs include video circuitry on their logic boards; with many models, you can increase the number of colors displayed on certain monitors by adding additional video memory, called *VRAM*. Most Macs also accept plug-in video boards that control color or large-screen monitors or add other display talents, including the ability to attach the Mac to videocassette recorders (see Chapter 21).

You can connect more than one monitor to most Macs by adding additional video cards or slower SCSI video adapters. In a Mac connected to multiple monitors, each monitor is driven by its own video circuitry and has its own VRAM.

BACKGROUNDER

System 7 and Upgrades

Where hardware upgrades and System 7 are concerned, one area is of special concern — virtual memory, that System 7 feature that lets the Mac treat part of a hard disk as memory. System 7's virtual memory software relies on certain ROM routines that aren't present in Pluses or SEs. Thus, the virtual memory feature works only with Macs designed around the 68030 processor, or with original Mac IIs equipped with the optional PMMU chip.

To work around this problem, many accelerator boards include Connectix Corporations' Virtual utility software. What does this mean for accelerator shoppers? If you want virtual memory in your 68030-accelerated Plus, SE, or Classic, be sure a 68030 accelerator includes or is compatible with the Virtual utility before you buy. And if you want virtual memory without having to use a third-party utility, buy an Apple 68030 logic board upgrade or a new machine instead of an accelerator.

What's slick about this approach is that it lets you mix and match different types of video hardware and displays — a color monitor and a two-page color display, a VideoVision monitor and a full-page monochrome display, a PowerBook's LCD screen and a color video projector. And you can drag windows from one display to another, or even position a window to span displays. Because the Mac keeps track of each monitor's capabilities, it can adjust the way it displays the window on each monitor.

Ethernet boards

Ethernet is a networking system that transfers data more quickly than does the Mac's built-in LocalTalk port. Ethernet is built into many mid-range and high-end Macs, including the Centris and Quadra families. A variety of Ethernet adapters is available for other Macs, including PowerBooks.

POWERBOOK ANGLE

PowerBook Video

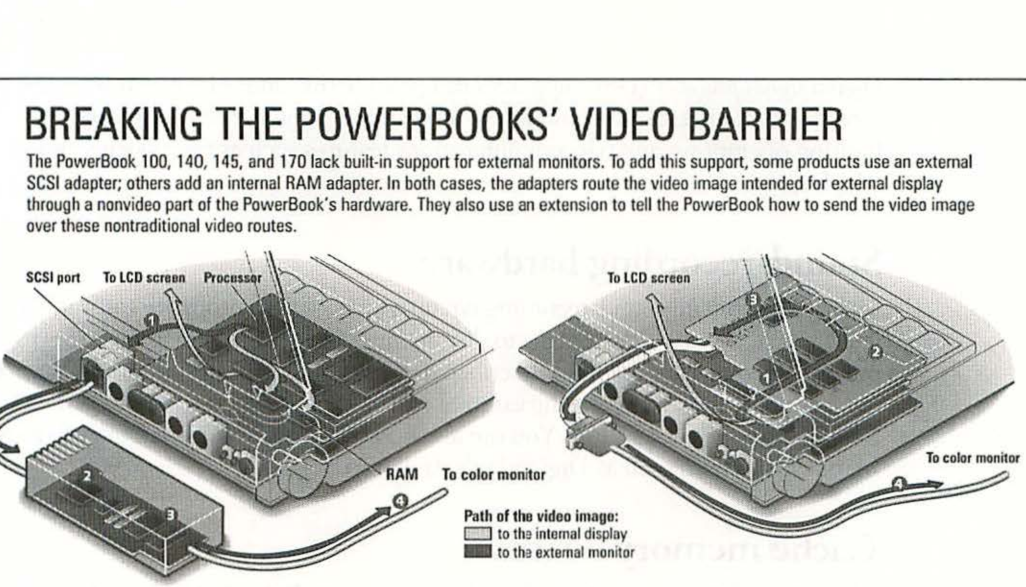
As I described in Chapter 16, you can connect an external monitor to most PowerBooks and use the PowerBook Display control panel to specify that the external monitor be used as an extension of the PowerBook's desktop or that it duplicate the contents of the PowerBook's screen.

If your PowerBook doesn't directly support external video, there's still hope. Several firms offer monitors that connect to the PowerBook's SCSI port. Some firms also offer adapter boxes that attach between the PowerBook's SCSI port and a conventional monitor. The pros: SCSI-based monitors require no additional circuitry in the PowerBook. The cons: The screen works in slow motion.

You can also shoehorn a third-party video expansion board into the PowerBook's case (see Figure 31-1). Such boards support most common monitor sizes and perform much better than SCSI monitor adapters. Also, the ROM chips in the PowerBook 140, 145B, 145, and 170 contain the software required to drive a color display. With an external video port, your PowerBook will have color capabilities comparable to the latest models. On the down side, the video board's circuitry will add heat to the case and you can damage a PowerBook by installing the upgrade incorrectly.

BREAKING THE POWERBOOKS' VIDEO BARRIER

The PowerBook 100, 140, 145, and 170 lack built-in support for external monitors. To add this support, some products use an external SCSI adapter; others add an internal RAM adapter. In both cases, the adapters route the video image intended for external display through a nonvideo part of the PowerBook's hardware. They also use an extension to tell the PowerBook how to send the video image over these nontraditional video routes.



External SCSI Adapters

Most adapters include an extension that intercepts the QuickDraw commands that describe a video image; the extension then sends a copy of the commands over the SCSI port to the external adapter **(1)**. A processor on the adapter's own logic board translates the QuickDraw commands into the video image **(2)** and stores the resulting screen bitmap in VRAM **(3)** within the adapter. The adapter then sends the image for display on the external monitor **(4)**. Because the Radius PowerView has no processor, it relies on the PowerBook's processor to translate the QuickDraw commands. Because SCSI is inherently slow, SCSI video adapters are slow.

Internal RAM Adapters

Some adapters include an extension that intercepts the QuickDraw commands that describe a video image; the extension then sends a copy of the commands to the adapter board **(1)**, which plugs into the PowerBook's RAM slot. A processor on the adapter's own logic board translates the QuickDraw commands into the video image **(2)** and stores the resulting screen bitmap in VRAM **(3)**. The adapter then sends the image over a special dealer-installed connector for display on the external monitor **(4)**. Vendors whose adapters have no processor follow the same process but rely on the PowerBook's processor to translate the QuickDraw commands.

Figure 31-1: Breaking the PowerBook's Video Barrier

Coprocessors

These specialized microprocessors work along with the Mac's CPU, lightening its load. *Math coprocessors* speed up calculations in spreadsheets and other number-crunching programs. Math chips are often built into or offered for accelerator boards, and are available on plug-in expansion cards for the Mac LC and IIsi. (Other Mac IIs and the SE/30 include math chips; the LC can accept one via its expansion slot.)

Graphics coprocessors, also called *graphics accelerators*, are generally used with or included on 24-bit video cards, which enable Macs to display images with photographic realism, but must move megabytes of data to do it. Without a graphics accelerator, true color can require true patience.

Digital signal processor (DSP) upgrades can provide the kinds of sophisticated features built into the AV Mac models — sophisticated audio, faster Photoshop filtering operations, and telecommunications features such as fax modems and voice telephones.

Sound-recording hardware

Most Macs contain sound-recording circuitry that, with appropriate software, lets you "attach" recorded comments to documents and send voice mail messages to other Macs on a network. As I described in Chapter 22, you can add sound-recording features to other Macs using external hardware such as Macromedia's MacRecorder Sound System Pro. You can also add CD-quality audio circuitry to most Macs with a board such as Digidesign's Audiomedia II.

Cache memory boards

These special-purpose memory boards provide a modest speed kick by storing the most recently used instructions and data in a small amount (usually 128K) of high-speed memory that the processor can access faster than main memory. For a few hundred dollars, you can add a cache memory board to the Mac IIci, which contains a slot designed specifically for one. Cache memory is built into the Mac IIfx as well as 68040-based Macs. Some Quadras can also accept additional cache memory through an expansion board such as DayStar Digital's FastCache Quadra.

Assessing Your Slot Options

Before you start musing over which upgrades to buy, it's important to know that some Macs are less receptive to upgrades than others. The Classic, Plus, and earlier machines are particularly resistant to improvement. They're sealed boxes, with no expansion slots for accepting plug-in boards such as video boards, accelerators, and high-speed networking boards. To work around this, upgrade developers generally use the *Killy Clip*, a clip that straddles the machine's processor and thus taps into the signals that would otherwise be provided by an expansion slot.

Upgrading most other Macs is generally straightforward, because all other models provide at least one slot. With the single-slot Macs — models that include the SE, SE/30, LC series, Centris 610 and 660AV, and Mac IIsi — there isn't much room to grow, so you'll need to choose upgrade options carefully. Fortunately, the single-slot members of the Centris family have plenty of built-in features.

Surveying the slots

To understand the benefits of slots, you need to understand the *bus* — an internal freeway that carries data between the Mac's memory, its microprocessor, and a variety of support chips.

All Macs contain two primary buses — the *address bus*, which carries signals from the microprocessor that specify where in memory data is to be stored or retrieved, and the *data bus*, which carries the data itself. With only a few exceptions, all the data that moves within the Mac does so on its data bus. Thus, the speed of the bus is one of the many factors that determines a Mac's overall performance.

When you consider the significant role it plays, the advantages of tapping into the bus become clear. With direct access to the microprocessor, to memory, and to many of the timing and control signals inside the Mac, a device connected to the bus becomes an integral part of the Mac. Accelerator boards are able to supplement or even supplant the Mac's microprocessor with their own.

Another advantage is speed. A device connected directly to the bus can transfer data and communicate with memory far faster than it could using one of the Mac's external connectors. If the bus is a freeway, then a slot is a set of on and off ramps, ready to accommodate high-performance add-ons without clips, voided warranties, or fried power supplies.

Comparing PDS and NuBus slots

Most compact and low-cost Macs — the Classic series and LC series — contain one *processor direct slot* (PDS), which allows access to all of the control, address, and data signals of the 68030 processor that these machines use. Mid-range and high-end Macs often contain a PDS too: An expansion board plugged into a PDS has the potential to deliver faster performance than a NuBus slot. The SE also contains one slot; it's much less sophisticated than those of its successors, although it's adequate for accelerator boards and large-screen video cards.

The primary means of expansion in the Mac II, Centris, and Quadra families are *NuBus* slots. These Macs provide from one to six NuBus slots. Many models also provide one processor-direct slot (see Table 31-1 "Counting Slots").

Variations on the NuBus theme

The NuBus slots in the Centris 660AV and Quadra 840AV support a newer version of the NuBus standard called *NuBus-90*. Among other things, the NuBus-90 specification allows for faster data transfers across the bus — an important advantage for audio and video applications, which involve transferring megabytes of data.

Table 31-1
Counting Slots

Macintosh Model	*NuBus Slots*	*PDS Slots*
Plus and earlier; Classic, Classic II	0	0
SE	0	1
SE/30	0	1
Color Classic, Color Classic II	0	1
LC family, Performa 400 series, Performa 550, Quadra 605	0	1
II, IIx, IIfx	6	0 (IIfx, 1)
IIcx	3	0
IIci	3	1
IIsi, Centris 610, Centris 660AV*	1	1
IIvx, Performa 600	3	1
Centris 650	3	1
Quadra 700	2	1
Quadra 900, 950	5	1
Quadra 800, 840AV	3	1
Duo Dock*	1	1

*These models provide one slot that can accommodate either a PDS board or a NuBus board.

Compact Centris models such as the 610 and 660AV can accept NuBus cards that are up to seven inches long and use a maximum of 10 watts of power. Other NuBus-capable Macs can accept cards up to 12 inches long. A much bigger selection of large cards is available.

To use a NuBus board with the Mac IIsi or compact Centris (such as a 610 or 660AV), you need an adapter such as Apple's NuBus Adapter Card. This card contains the chips that enable the IIsi to communicate with a NuBus card. (The IIsi adapter card also includes a math coprocessor.) The adapter card also contains the 96-pin NuBus connector into which you plug your NuBus board, which runs from front to back within the computer's case, parallel to the logic board.

BACKGROUNDER

The NuBus Advantage

NuBus is named for a standard that was developed at the Massachusetts Institute of Technology and refined in 1985 by a standards committee comprising representatives from MIT, AT&T, Texas Instruments, Apple, and others. The NuBus standard specifies everything from how expansion boards access the internal bus to such physical details as the distance between the slot's pins.

NuBus slots overcome two of the classic drawbacks of slots — forcing users to fuss with small switches inside the case that tell the computer what hardware you've installed, and making it harder for software developers to write software that runs on different system configurations.

Every NuBus board contains a *configuration ROM* — a read-only memory chip that identifies the board and describes its capabilities. When you switch on a NuBus Mac, its Slot Manager consults each board's configuration ROM and then sets up your system accordingly. Thus, installation is usually a plug-and-play proposition.

Apple tackled the software compatibility problem by designing the Mac's system software to act as an intermediary between programs and your hardware. Properly written Mac programs avoid accessing hardware directly; instead, they use Macintosh Toolbox routines, which access the hardware. So as long as software developers follow Apple's guidelines, their programs will run on any Mac, regardless of the boards it contains.

In recent years, Apple has extended Slot Manager support to the PDS slots that many machines provide. Thus, a PDS expansion board can also have a configuration ROM and set itself up automatically at start-up time.

Upgrade Recommendations for Compact Macs

Here are my upgrade recommendations for the compact Mac models.

- *Plus or earlier* Sell it or supplement it with a new machine.
- *SE* Accelerators and large-screen monochrome monitor adapters (sorry, no color) are available, but you'll probably be more satisfied with a newer Mac such as a Color Classic or LC III.
- *SE/30* Install an upgrade board for acceleration, Ethernet networking, or color video. Don't replace your SE/30 with a Classic II — the SE/30 is three to four times faster.
- *Classic* Consider the Classic II logic board upgrade.
- *Classic II (Performa 200)* Sell it and buy a more capable model such as a Color Classic or LC III.
- *Color Classic* Add a VRAM upgrade for 16-bit (32,000 colors) video. Install an upgrade board for acceleration, Ethernet networking, or 24-bit color video.

Upgrade Recommendations for the LC Family

In this section I spotlight some upgrade options for the LC family.

- *LC and LC II (Performa 400, 405, 430)* Consider the LC III logic board upgrade.
- *LC III (Performa 450)* A video RAM upgrade gives you more colors. A math coprocessor speeds complex math calculations and 3-D graphics rendering. Accelerator boards are also available.

Upgrade Recommendations for the II Family

- *II, IIx* Apple offers a logic board upgrade that turns a II or IIx into a IIfx, but think twice before buying it. For one thing, you'll also need to buy memory: The IIfx can't use your Mac II or IIx's existing SIMMs. For another, if you have a Mac II, you'll probably want the SuperDrive upgrade, too. When you're finished, you'll have a machine that's still quite a bit slower than today's faster Macs. An accelerator board is a better bet. For ease of installation, the Radius Rocket is best: It installs in a NuBus slot and doesn't require the delicate chip-pulling surgery that DayStar's Universal PowerCache does. The Rocket's ability to accommodate up to 128MB of memory (using standard SIMMs) is another plus. On the down side, the Rocket has compatibility problems with QuickTime and sound-oriented products.
- *IIcx* Consider the Quadra 700 logic board upgrade. Almost all IIcx machines contain soldered rather than socketed CPU chips, and that means problems for accelerator boards. Note that after adding an accelerator, some weak spots remain, including a relatively slow SCSI port and no Ethernet networking. One strategy might be to combine a Radius Rocket equipped with the SCSI-2 Booster card with one of E-Machines' ColorLink series video boards, which also provides Ethernet ports. This leaves one slot free for, say, a video-capture board.
- *IIci* Consider the Quadra 700 logic board upgrade. The Quadra 700 logic board replacement provides improved performance, 24-bit video, Ethernet, and faster NuBus and SCSI operations. If you're just after a speed kick, you have accelerator options galore. Simply installing a video-display board and not using built-in video improves performance, though not as significantly as a cache card or an accelerator.
- *IIsi* A smaller number of accelerators are available for the IIsi than other Mac IIs, thanks largely to its featherweight power supply. A PDS accelerator (which doesn't require its own memory) is a safer bet. Overall, the best way to expand a

IIsi is with a NuBus expansion chassis from Second Wave. The Expanse NB8 and Expanse NB4 are desktop boxes that provide eight and four NuBus slots, respectively, as well as a power supply and fan. An adapter board plugs into Apple's NuBus adapter board, which is, in turn, installed in the IIsi's PDS. There's even room in the chassis case for an internal SCSI hard drive. If you need fast 24-bit video and an Ethernet port, consider one of E-Machine's ColorLink SX-series NuBus boards. (Using a video card instead of the IIsi's built-in video also results in a modest performance improvement.) If you want an accelerator and improved video or networking, your choices are simple: Buy an expansion chassis or a more-expandable Mac.

- *IIvx (Performa 600)* For thousands of colors on most monitors instead of 256, add a VRAM SIMM to bring video memory up to 1MB. If you're interested in multimedia, CD-ROMs, or Kodak's PhotoCD system, consider adding Apple's 300i internal, double-speed CD-ROM drive. If you crave speed, consider an accelerator — or better yet, the Centris 650 logic board upgrade. In addition to a roughly 100 percent improvement in overall performance, you'll get a faster SCSI port and built-in Ethernet. The Centris 650 can't use any 1MB SIMMs you may have (its minimum SIMM size is 4MB), but this isn't a significant drawback, because the upgrade includes 8MB of RAM.

Upgrade Recommendations for the Centris Family

The Macs in the Centris clan have more features than a movie theater complex. Here's how to make a good thing even better.

- *Centris 610* Add a VRAM upgrade to display thousands of colors on larger monitors. Buy the Centris 660AV logic board upgrade for sophisticated video, audio, and telephony features.
- *Centris 650* Add a VRAM upgrade to display thousands of colors on larger monitors. The Radius Rocket is compatible with the Centris 650 when used with Radius' RocketShare software. A Rocket-equipped Centris 650 running RocketShare essentially gives you two 68040-based Macs in one case — a pleasing proposition for the power hungry (see the Background box "Taking Off with RocketShare").
- *Centris 660AV* Add a VRAM upgrade to display thousands of colors on larger monitors.

Memory Upgrade Details

In this section, I provide some background into how memory chips work and outline the memory-upgrade options available to each Mac model. If you have a CD-ROM player, check out the Connectix Macintosh Memory Guide on the *Macworld Complete Mac CD* included with this book — it's a first-rate guide to Macintosh memory issues and options.

Memory background

There are many types of memory, but most fall into either of two broad categories: *ROM* and *RAM.* You can't venture into the Mac world without encountering these two acronyms, so it helps to understand the concepts behind them.

Prerecorded memory

ROM stands for *read-only memory:* The Mac can read the contents of a ROM chip, but it can't change them. As I described in Chapter 1, a ROM chip's software is in there for good, prerecorded at the factory like the music on a compact disc. The only real threat to ROM is an electrical mishap such as a power surge or a spark of static electricity.

RAM — memory that forgets

As you saw in Chapter 1, RAM performs the vital job of storing the documents you create and the software you use to create them. RAM is the Mac's temporary workspace: When you start a program, one of the Mac's first jobs is to copy the

BACKGROUNDER

Taking Off with RocketShare

RocketShare is a software package that works with one or more Radius Rocket accelerators to provide a kind of parallel processing — the ability to spread a complex computing job across multiple processors.

With RocketShare, the Mac's logic board and the Rocket each appear on the screen as a separate Mac, each with its own desktop. With such a setup, you can, say, start a large image scan with one of the two "Macs," and then switch to the other one's window and do something else. Or you can use a program such as NetRenderMan to divide a large 3-D rendering job between each virtual machine.

You can also combine a PDS- or cache slot-based accelerator with a Radius Rocket running RocketShare. With this scheme, you get not one fast Mac (the Rocket), but two (the Rocket and the accelerated logic board).

program from disk into RAM. Similarly, the Finder loads into RAM when you start up the Mac.

RAM chips are often referred to as *DRAM* (pronounced *dee-RAM*) chips. *D* is for *dynamic* and reflects the chip's need for a periodic electronic nudging, or *refresh signal*, that enables it to retain its contents. The other major type of RAM chip, *static RAM*, doesn't require a refresh signal and therefore uses less power. But static RAM chips are more expensive than their dynamic counterparts; as a result, most deskbound computers use DRAM chips. All-in-one PowerBooks such as the 170, 180, and 180c use *pseudo-static RAM* chips, which contain their own refresh circuitry.

Introducing SIMMs

The DRAM chips used in deskbound Macs are connected in groups of eight on small plug-in circuit boards called *Single Inline Memory Modules*, or *SIMMs*. (The Mac Portable and PowerBook models use their own specialized memory boards.)

The amount of information a DRAM chip can hold is determined by the chip's *density*, which is measured in kilobits. One kilobit, or *Kbit* for short, equals 1,024 bits. The most common DRAM sizes are 256-Kbit, 1-megabit, and 4-megabit. A 1MB SIMM ties eight 1-Mbit DRAM chips together on a plug-in circuit board. A 4MB SIMM uses eight 4-Mbit DRAMs.

Tip: When upgrading RAM, you may need to consider the physical size of the SIMMs. *Low-profile* SIMMs are the thinnest, and are able to fit within the cramped confines of, say, a Quadra 700. (Some of the SIMM banks in the Quadra 900 and 950 are also a tight squeeze.) *Composite SIMMs* are fatter and may not fit in some Macs. Today's 16MB SIMMs are composite SIMMs: Instead of using eight 16-Mbit DRAM chips, a composite 16MB SIMM uses 32 4-Mbit chips.

Memory speeds

When shopping for SIMMs, you'll see specifications that describe their speed — 100ns chips, 80ns chips, and so on. The time required for the Mac to successfully read from or write to a DRAM chip is called its *access time*. For example, the Mac Classic requires DRAMs with an access time of 120 nanoseconds (*ns*, or one billionth of a second). The faster Mac LC III and LC 520 require 80ns DRAMs, while the Quadra 840AV needs 60ns DRAMs. Table 31-2 lists Mac family DRAM speed requirements.

When shopping for Mac memory upgrades, look for chips whose access time equals or is faster than that required for your Mac. You can use DRAMs with a faster access time than your Mac requires. For example, 80ns DRAMs work fine in

Table 31-2
SIMM Speed Limits

Mac Model	*DRAM Speed Requirement*
Plus, SE	150 ns
Classic, SE/30, II, IIx, IIcx	120 ns
IIsi, LC, LC II, Classic II; Performa 200, 400, 405, 430	100 ns
IIci, IIfx, IIvx, Quadra 700, Quadra 900, Quadra 950, Performa 600, LC III, LC 520, Centris 610, Centris 650, Performa 400 series, LC 475, Performa 550	80 ns
Quadra 800, Centris 660AV	70 ns
Quadra 840AV	60 ns

a Mac IIsi, but they won't improve performance, because the Mac IIsi's circuitry is designed for the timing of 100ns DRAMs.

There is one good reason to buy faster DRAMs than your Mac requires: If you upgrade to a faster model, you can use your old SIMMs.

Bank deregulation: 72-pin versus 36-pin SIMMs

Beginning with the Mac LC III, Centris series, and Quadra 800, Apple switched from SIMMs containing 36 pins to ones with 72 pins. (The Mac IIfx requires special, 64-pin SIMMs.) The newer SIMM design has several advantages — some practical, others technical. On the practical side, the 72-pin SIMMs are common in the DOS PC world. This means businesses that mix Macs and PCs can also mix SIMMs — a real convenience.

On the technical side, the 72-pin SIMMs eliminate one of the common hassles of Mac RAM expansion — dealing with banks of SIMM slots. Macs that use 36-pin SIMMs provide sets of SIMM slots; each set of four is called a *bank.* When expanding memory in such a Mac, you must take care to fill each bank in a specific way. For example, in a Mac IIci, which has two banks of four slots each, you must fill all four slots in a bank with SIMMs of the same capacity. And if you mix SIMM capacities in the two banks, you must put the higher-capacity SIMMs in Bank B if you use the IIci's built-in video. These arcane rules don't exactly reinforce the Mac's ease-of-use reputation.

Macs that use 72-pin SIMMs spare you from this agony. In a Centris 650, for example, there's no difference between a slot and a bank — a slot *is* a bank. So in the

Accessing More Than 8MB On an Older Mac

System 7 enables the Mac to access more than 8MB of memory, but the ROM chips in some Macs — the II, IIx, IIcx, and SE/30 — are not what Apple calls *32-bit clean;* that is, they don't follow all the rules necessary to operate under 32-bit addressing. As a result, these Macs can't access more than 8MB of RAM.

Fortunately, this problem is easy to fix: Simply use the MODE32 control panel. MODE32 was developed by Connectix Corporation, and has since been licensed by Apple. MODE32 is included with many memory upgrades and is also available free through user groups and on-line services. If you use System 7.1 or a later version, you can also use Apple's 32-Bit System Enabler, also available through on-line services and user groups.

Also note that the original Mac II can't use standard 4MB SIMMs. Instead, you need special nine-chip SIMMs that contain a *programmable-array logic* (PAL) chip. If you want to use 4MB SIMMs on an original II, be sure to specify that you're buying them for this machine. This restriction doesn't apply if you get Apple's SuperDrive upgrade kit for the original II. This upgrade kit also includes new ROM chips that eliminate the need for special 4MB SIMMs.

latest Macs, the overly technical "banking regulations" are things of the past. Simply fill as many of the slots as you like, and the Mac will use whatever RAM it finds.

Appendix C lists memory configurations for various Mac models.

Installing a Memory Upgrade

Installing SIMMs isn't hard, but it is delicate. The SIMM slots in many Macs use plastic retaining clips that are easily broken. (Most newer Macs provide SIMM slots with metal clips that are easier to work with and more durable.) A slot with a broken clip won't hold the SIMM tightly enough for reliable operation; you'll probably have to replace the Mac's entire logic board.

Most companies that sell RAM upgrades include informative booklets and even videos that show how to tackle the job. Before you start, heed the static electricity precautions I've outlined previously: If you live in a static prone area (one where the humidity is very low), consider using an anti-static wrist strap, available through most computer dealers and mail-order houses.

If you're feeling clumsy, have a technician install the memory upgrade for you. It won't cost much, especially compared to replacing a damaged logic board.

A Closer Look at Video Upgrades

Given the Mac's graphical personality, it isn't surprising that some of the most popular upgrades involve video. This section describes Mac video upgrade issues.

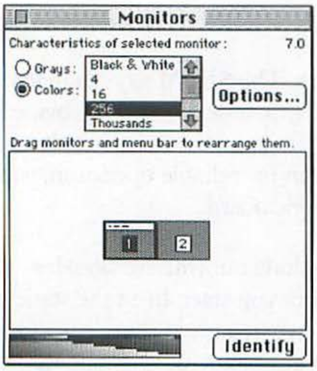
Reviewing video basics

I'll start by examining how color Macs display their images. You may recall from previous chapters that the Mac uses a bitmapped display. On a monochrome Mac such as a Classic II, each screen dot, or pixel, corresponds to one bit in the Mac's memory. When a given bit has a value of one, its corresponding pixel is on, or black. When a bit has a value of zero, its pixel is off, or white.

Because a bit can have only one of two values (1 or 0), a bitmapped display that uses one bit per pixel can display only two colors — black or white. Shades of gray can be simulated by *dithering*, in which groups of pixels are combined into patterns. The Mac's gray desktop is an example of a dithered pattern formed by evenly spaced, alternating black and white pixels.

The color and grayscale difference

The secret to displaying color or true shades of gray is to assign additional bits to each pixel — what many people refer to as increasing the *pixel depth*. Each additional bit lets a color Mac store more information about the pixel. Two bits per pixel can represent four colors. Four bits can represent 16 colors, and eight can represent 256 colors. You can tell a color Mac how many bits to assign each pixel by using the Monitors control panel (see Figure 31-2 "Bits and Pixels").



Characteristics of selected monitor: 7.0

○ Grays:

● Colors: 256

Drag monitors and menu bar to rearrange them.

Figure 31-2: Bits and Pixels
The Monitors control panel lets you specify how many bits the Mac should assign to each pixel, and whether it should display colors or shades of gray. If you have more than one video board installed (as is the case here), you can also specify where the menu bar should appear.

But how can only two bits represent four, eight, or 256 colors? In a color Mac's VRAM, the bits that represent each pixel can be on (assigned a value of 1) or off (assigned a value of 0) in different combinations. For example, when two bits are assigned to each pixel, four on-off combinations exist — both bits on; both bits off; one bit on, second bit off; and second bit on, first bit off.

When four bits are assigned to each pixel, you get 16 on-off combinations. With eight bits per pixel, you get 256 combinations. Internally, the Mac uses 32 bits to describe colors, giving it the ability to create more than 16 million different hues (see Figure 31-3 "Looking Behind a Color Monitor"). But remember, the number of colors that can actually be *displayed* at once depends on the Mac and monitor size you use.

How many bits do you need?

Most older color Macs have color video circuitry that can assign a maximum of eight bits to each pixel, so they can display a maximum of 256 colors or gray shades simultaneously. This is excellent for grayscale image processing, and adequate for creating business presentations and graphs.

The video circuitry in most of today's desktop Macs can assign up to 16 bits to each pixel, allowing for 32,768 colors — plenty for viewing QuickTime movies and for basic image processing.

LOOKING BEHIND A COLOR MONITOR

The digital information that represents an image goes through several transformations before appearing on the Mac's screen. Each screen pixel starts life out as a chunk of 32 bits **(A)**—8 bits define red, 8 define green, and 8 define blue. The remaining 8 bits (the alpha channel) are reserved for special effects that vendors may opt to support. Lines of 32- bit information are queued up in a buffer on the video display board; the . lines are separated into 8-bit chunks, and each chunk is sent to a converter that transforms it from digital to analog information **(B)**. The board electrically intensifies each analog signal, so that it can drive its corresponding electron gun **(C)**. The higher the intensity, the more saturated the color. The red, green, and blue guns fire their color signal at the corresponding color phosphors on a monitor's screen **(D)**. Each set of red, green, and blue phosphors combines to create one color pixel on the screen.

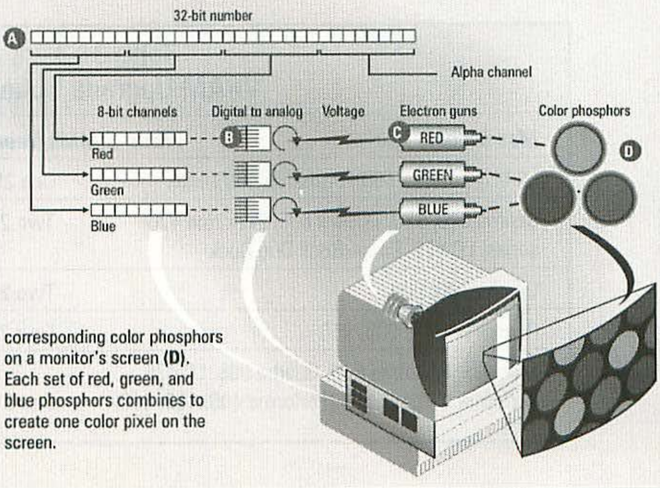


Figure 31-3: Looking Behind a Color Monitor

A Quadra's built-in video can work with up to 24 bits per pixel, allowing for 16.7 million colors — just the ticket for professional-level video, 3-D rendering, electronic photography, and image processing.

Expanding Video RAM

Most of today's Macs with built-in color video can accept VRAM expansion boards that allow for the display of more colors on certain monitors. If you have such a Mac, expanding its video RAM is a great (read *cheap*) way to enhance its display capabilities.

To expand video RAM, install SIMMs in the slots provided on the Mac's logic board. Table 31-3 shows what you need for each relevant model.

Mac Video Reference Tables

Table 31-4 lists the standard and expanded video display capabilities of various Mac models when used with the most common monitor sizes.

Many Macs containing built-in video circuitry can also drive larger monitors. Table 31-5 lists the standard and expanded video display capabilities of various Mac models when used with larger monitor sizes.

Table 31-3
VRAM Upgrade Options

Mac Model	*VRAM SIMMs Needed*
LC III (Performa 450), Performa 460 series	One 256K SIMM
Centris 610, 650, Quadra 605, Performa 470 series, LC 475, PowerBook Duo Dock	Two 256K SIMMs
Quadra 700, 800	Two 256K SIMMs or six 256K SIMMs
Quadra 840AV, 900, 950	Four 256K SIMMs
Mac IIvx, Performa 600, Quadra 605, LC 475, Performa 470, LC, LCII (Performa 400, 405, 430)	One 512K SIMM

Table 31-4
Built-in Video and Common Monitors

	Grays Displayed	*Colors Displayed*	
	12" Monochrome	*14" Display*	*16" Display*
LC, LC II, Performa 400, 405			
Standard	16	16	not supported
Expanded	256	256	not supported
LC III, Performa 450			
Standard	256	256	256
Expanded	256	32,768	256
Performa 430			
Standard	256	256	not supported
IIsi, IIci			
Standard	256	256	not supported
IIvx, Performa 600			
Standard	256	256	not supported
Expanded	256	32,768	not supported
Centris 610, 650, Quadra 605, LC 475, Performa 475, 476			
Standard	256	256	256
Expanded	256	32,768	32,768
Centris 660AV			
Standard	256	32,768	32,768
Quadra 700, 800			
Standard	256	256	256
1 VRAM expansion	256	16.7 million	256
2 VRAM expansion	256	16.7 million	16.7 million
Quadra 840AV			
Standard	256	32,768	32,768
Expanded	256	16.7 million	16.7 million
Quadra 900			
Standard	256	256	256
Expanded	256	16.7 million	16.7 million
Quadra 950			
Standard	256	32,768	32,768
Expanded	256	16.7 million	16.7 million
Duo Dock			
Standard	256	256	256
Expanded	32,768	32,768	32,768
IIcx, II, IIx, IIfx	card required	card required	card required

Table 31-5

Built-in Video and Large Monitors

	Colors Displayed	*Grays Displayed*	
	21" Color Display	***2-Page Monochrome***	***Portrait Display***
LC, LC II, Performa 400	not supported	not supported	not supported
LC III, Performa 405, 430, 450, LC520, LC475, Performa 470 series			
Standard	not supported	not supported	16
Expanded	not supported	16	256
IIsi, IIci			
Standard	not supported	not supported	16
IIvx, Performa 600			
Standard	not supported	not supported	not supported
Expanded	not supported	not supported	not supported
Centris 610, 650			
Standard	16	not supported	16
Expanded	256	not supported	256
Centris 660AV			
Standard	32,768	256	256
Quadra 700			
Standard	16	16	16
Expanded	256	256	256
2 VRAM expansion	256	256	256
Quadra 840AV			
Standard	256	256	256
Expanded	32,768	256	256
Quadra 900			
Standard	256	256	256
Expanded	256	256	256
Quadra 950			
Standard	256	256	256
Expanded	32,768	256	32,768
Duo Dock			
Standard	not supported	not supported	256
Expanded	not supported	not supported	256
IIcx, II, IIx, IIfx	card required	card required	card required

QUICK TIPS

Video and the IIsi and IIci

For IIci and IIsi owners, there's a price to pay for on-board video. In its 16- and 256-color modes, the on-board video in the IIci and IIsi provides slower performance than does a plug-in video board, which provides its own video memory. That's because the Mac's CPU often has to wait to access memory because the video circuitry accesses the same bank of memory in the course of creating screen images. Two office workers can use the same filing drawer to store different things, but they cannot access the drawer at the same time.

What kind of performance penalty can you expect? In tests performed by Macworld Lab, a Mac IIsi using built-in video was almost twice as slow in 256-color mode as a IIsi using a NuBus video board. This performance penalty doesn't apply to other Macs with built-in video — they provide dedicated video RAM. And because the video circuitry uses part of the Mac's main memory to hold the screen image, less memory is available to run programs — up to 320K less in the 256-color mode.

The tip? To speed up a IIci or IIsi and free up some memory, install a video board.

Upgrade or New Machine?

Buying the right upgrade requires pinpointing your present Mac's weaknesses: Do programs take too long to start, or documents too long to open? You may need a faster hard disk. After a program starts, does it run sluggishly? What aspects of its operation are sluggish? Do calculations take too long? A math coprocessor or an accelerator or logic board upgrade may be in order. Do color graphics ooze onto the screen? You may need a graphics accelerator. If you answer "all of the above," think about a new, faster machine.

Last but far from least, it's important to assess your financial options to determine which will cost less — upgrading an existing Mac or selling it and buying a new one. In the Mac's early days, upgrading an existing machine usually made better financial sense, because the only alternative was a considerably more expensive new machine. As Apple continues to lower prices, the decision isn't as easy. Given the cost of hardware upgrades — and the compatibility and reliability risks that sometimes accompany them — a new machine may be the smarter buy. And even if a new machine costs slightly more, the extra features it provides may be worth the cost.

There's another plus to buying a new machine: You get a blank slate that's ready to accept all the upgrade options that will be developed for it. That knowledge will be comforting when the next convoy of new trains rolls out of Apple Station.

CHAPTER 31 CONCEPTS AND TERMS

- You can upgrade an older Mac to give it most, if not all, of the features present in current machines. You can also upgrade a new Mac to make a good thing even better.
- Hardware upgrades fall into two broad categories — ones that make your Mac faster, and ones that add new features such as additional storage or the ability to display more colors.
- The most common upgrades include memory, hard drives, accelerator boards, new logic boards, video memory expansion, Ethernet networking boards, sound-recording hardware, and cache memory boards.
- The two basic categories of memory are ROM (*read-only memory,* which permanently holds portions of the Mac's system software) and RAM (*random-access memory,* which holds the programs you're running, open documents, and RAM-based portions of the Mac's system software).
- Some Macs are less receptive to upgrades than others. The Classic, Classic II, Plus, and earlier machines do not contain expansion slots for plug-in boards.
- When considering whether to upgrade an older Mac or buy a new one, it's important to pinpoint your Mac's weaknesses and then assess your financial options to determine which will cost less.

32-bit clean
A phrase that refers to software that follows Apple's guidelines for operating in a 32-bit environment. Software that is not 32-bit clean may crash under System 7 if 32-bit addressing in enabled (in the Memory control panel). Also, the ROM chips in older Macs are not 32-bit clean, and thus, limit those models to a maximum of 8MB of RAM. You can work around this limitation by using Connectix's MODE32 extension or, with System 7.1, Apple's 32-Bit System Enabler.

access time
The time required, in nanoseconds (billionths of a second; abbreviated *ns*) to successfully read to or write from a RAM chip. Some Macs require faster RAM chips than others; the IIci needs 80ns RAM chips, while the Plus and SE can use slower chips. You can use chips with a faster access time than your Mac needs, but they won't speed up processing; the computer's circuitry is designed for chips with a specific access time.

bank
In older Macs (ones that use 36-pin SIMMs), a set of four SIMM slots. In newer Macs (ones that use 72-pin SIMMs), a bank is a single SIMM slot.

bit
Short for *binary digit,* the smallest unit of computer storage. A bit can represent one of two states — 1 (on) or 0 (off).

bus
An internal freeway that carries data between the Mac's memory, its microprocessor, and a variety of support chips. All Macs contain two primary buses — the *address bus*, which carries signals from the microprocessor that specify where in memory data is to be stored or retrieved, and the *data bus*, which carries the data itself. Expansion slots provide electronic on-ramps and off-ramps to this digital freeway.

byte
The workhorse of information storage, equal to 8 bits. one byte can represent any of 256 values, since its 8 bits can be on or off in 256 different combinations. A byte can represent a single character. Storing the alphabet requires 26 bytes.

configuration ROM
A read-only memory chip, present on a NuBus or PDS expansion card, that identifies the card and describes its capabilities.

density
The capacity, in bits (not bytes), of an individual RAM or ROM chip. The most common densities are 256 kilobits and 1 megabit. By tying 25 6-Kbit, 1-Mbit, or 4-Mbit RAM chips together in groups of eight, a SIMM board can store 256K, 1MB, or 4MB, respectively.

DRAM
Pronounced *dee-ram,* an acronym for *dynamic random-access memory,* the most common type of RAM chip in the computer world. The amount of information a DRAM chip can hold is determined by the chip's *density,* which is measured in kilobits.

gigabyte
1,024 megabytes; abbreviated as *GB.*

Killy Clip
A clip, used in some accelerator boards for compact Macs, that straddles the machine's processor and thus taps into the signals that would otherwise be provided by an expansion slot.

kilobit
1,024 bits; abbreviated as *Kbit.* The capacities of individual RAM chips are measured in Kbits.

kilobyte
1,024 bytes; abbreviated as *K.*

megabit
1,048,576 bits; abbreviated as *Mbit.*

(continued on the next page)

(continued from the previous page)

megabyte
1024 kilobytes; abbreviated as *MB.*

NuBus slot
An expansion connector named for a standard developed at the Massachusetts Institute of Technology and refined in 1985 by a standards committee comprising representatives from MIT, AT&T, Texas Instruments, Apple, and others. The NuBus standard specifies everything from how expansion boards access the internal bus to such physical details as the distance between the slot's pins.

pixel depth
A phrase often used to describe how many bits are assigned to each screen pixel. For example, a Mac that can display millions of colors might be described as having a 24-bit pixel depth.

processor-direct slot
An expansion connector that allows access to all of the control, address, and data signals of the Mac's microprocessor.

RAM
An acronym for *random-access memory,* the memory that stores the programs you run and the documents you create.

ROM
An acronym for *read-only memory.* The Mac can read the contents of a ROM chip, but it can't change them. A ROM chip's software is in there for good, prerecorded at the factory like the music on a compact disc.

SIMM
An acronym for *Single In-line Memory Module,* the small circuit board that holds individual RAM chips (usually eight). You expand a Mac's memory by adding SIMMs. *Low-profile* SIMMs are the thinnest. *Composite SIMMs* are fatter and may not fit in some Macs.

VRAM
An acronym for *video RAM* — the memory that stores the bits that form a Macintosh screen image.

CHAPTER THIRTY-TWO

Printers

IN THIS CHAPTER

- Surveying the types of printers available for the Macintosh
- Comparing ink jet and laser printers
- Understanding the differences between PostScript and QuickDraw printers
- Determining what kinds of features your printer needs
- Shopping for a color printer — is one in your future?

No matter how you use the Mac, chances are you need to commit your work to paper. In this chapter, I look at the types of printers available for the Mac, focusing on the most popular category — the laser printer.

What Kind of Printer?

Macintosh printers fall into four general categories. This section is an overview of each category — an introduction that sets the stage for the rest of the chapter.

Dot-matrix printers

Printers such as Apple's ImageWriter II are successors to the typewriter — they create text and graphics by striking an inked ribbon. But where a typewriter uses preformed characters, a dot-matrix printer uses a grid, or matrix, of fine wires located in a *print head* that moves from left to right across the page. By firing these wires in specific patterns, the printer can produce graphics and text in any typestyle. Where print quality is concerned, dot-matrix printers are on the bottom of the totem pole. However, because they're impact printers, they can print on carbon or carbonless multipage business forms such as invoices — a feat the other printers discussed here can't match. Dot-matrix printers are also ideal for printing mailing labels, because they can accept continuous feed paper stock (paper whose sheets are attached to each other, accordion-style).

Ink jet printers

Apple's StyleWriter series and Hewlett-Packard's DeskWriter are higher-class cousins of dot-matrix printers. Instead of using an inked ribbon and print wires to produce images, an ink jet printer uses several dozen microscopic nozzles that spray extremely fine streams of ink at the paper. Besides making the printer much quieter than its dot-matrix counterparts, this scheme allows for much finer print quality, or *resolution*. For example, the ImageWriter II has a maximum resolution of 144 dots per inch (dpi), while a StyleWriter can print 360 dpi. But ink jets have some distinct disadvantages — more about them later.

Laser printers

The type of printer most people associate with the Mac, laser printers use photocopier-like mechanisms to produce text and graphics with resolutions of 300 dpi and up. Laser printers are much faster than dot-matrix or ink jet units — even the least expensive models can print up to several pages per minute. Laser printers are also the preferred units for desktop publishing and proofing, because their resolution is high enough to accurately render the subtleties of typographic fonts and to print newspaper-quality halftones of scanned images.

Color printers

These specialized scribes use a variety of complex techniques to apply colored ink, dye, or wax to paper — usually to special paper, at that, although plain-paper color printers are becoming available. Low-end color printers are used for printing attention-getting overhead transparencies and business graphics. High-end units are often used for proofing color publications, scanned images, and illustrations that will be printed using four-color printing presses.

For critical color publishing applications, however, most publishing pros still rely on photographic *Matchprints* produced by color-separation service bureaus. But because such prints often cost $50 to $100 each, many publishers use color printers first to look for obvious errors in color balance or placement.

Ink Jet Details

As mentioned earlier, ink jet printers are capable of much higher output resolution than dot-matrix units. But ink jet output still isn't in the laser league (see Figure 32-1 "Print Output Comparisons"). Up close, even the naked eye can discern sloppy character edges created by ink seeping into the paper's fibers as it dries. Scanned images and large black areas have a mottled look. You can minimize these flaws by photocopying printed pages, but handle them gently: Ink jet output can smear in its first few seconds of life.

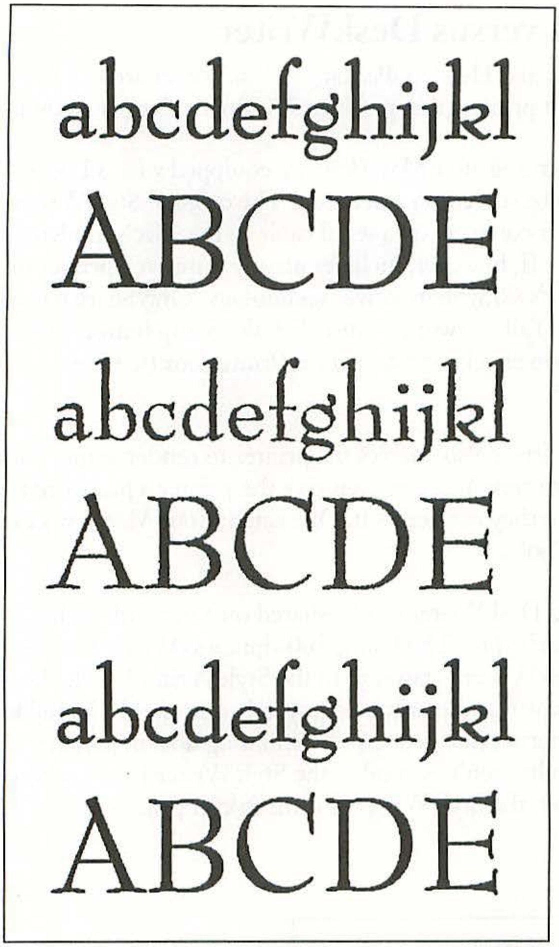

abcdefghijkl
ABCDE
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Figure 32-1: Print Output Comparisons Output samples from three types of printers, enlarged 200 percent. Top: 600-dpi output; middle: Ink jet output; bottom: 300-dpi laser output;. The high resolution of ink jet and laser printers enables them to more accurately render the subtleties of true typographic fonts. But note the fuzzy-edged quality of ink jet output caused by the ink spreading into the paper's fibers as it dries.

Today's ink jet printers no longer require special paper as did some pioneering models of the mid-80s, but they're still more finicky than lasers. Apple's StyleWriter and Hewlett-Packard's DeskWriter can't handle heavy card stocks and can't automatically feed multiple envelopes. And output quality varies dramatically depending on the quality of paper you use. You also wait longer to see it; most personal laser printers can churn out several pages in the time it takes an ink jet to produce one.

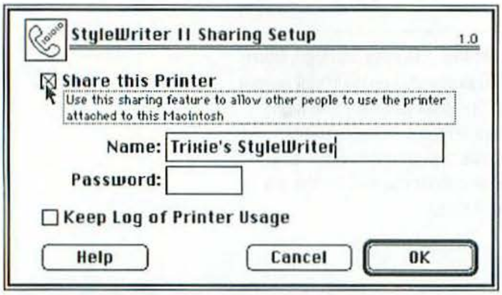
StyleWriter II versus DeskWriter

Apple's StyleWriter II and Hewlett-Packard's DeskWriter are two popular Mac-specific desktop ink jet printers that produce 300-dpi or sharper output.

DeskWriters manufactured after May 1990 are equipped with a LocalTalk connector, enabling them to be shared on a network. The original StyleWriter can't be shared on a network; it connects via a serial cable to the Mac's modem or printer port. The StyleWriter II, however, includes greatly improved printer driver software that sports Apple's GrayShare driver technology. GrayShare lets you share the printer on a LocalTalk network — just click the Setup button in the Chooser desk accessory and then check the Share This Printer box (see Figure 32-2 "Share Your StyleWriter II").

The StyleWriter II's driver also enables the printer to render scanned images better than some laser printers. You can even give the printer a password that other users must type before they can access it. One catch: Your Mac slows down when it processes other users' jobs.

The Hewlett-Packard DeskWriter can be shared on a network without slowing down the Mac it's attached to. The bulky, 300-dpi DeskWriter is aging but still spry. Overall, the DeskWriter is faster than the StyleWriter II. The latest DeskWriter driver improves the printer's grayscale output: HP has added additional options for dithering (the process of combining dots in patterns that simulate gray shades). The results aren't as good as the StyleWriter II's, however. For good grays on a tight budget, the StyleWriter II is the ink jet printer to buy.


StyleWriter II Sharing Setup 1.0

☒ Share this Printer

Use this sharing feature to allow other people to use the printer attached to this Macintosh

Name: Trixie's StyleWriter

Password:

☐ Keep Log of Printer Usage

Figure 32-2: Share Your StyleWriter II To share an Apple StyleWriter II printer on a network, click the Setup button in the Chooser (not shown here) to display the Sharing Setup dialog box. Then check the Share this Printer box. If you like, you can give the printer a name and password.

Printers for PowerBooks

The portable printer arena is heating up as printer manufacturers try to leverage off the success of Apple's PowerBook line.

The WriteMove II

For portability, you can't beat the GCC Technologies WriteMove II. Cut a box of aluminum foil in half vertically for a rough idea of how small this 2.5-pound puppy is. A sock would make a nice carrying case.

The WriteMove II runs on a rechargeable battery and also includes a cleverly designed AC adapter whose prongs fold down so as not to puncture your briefcase. Technically, the printer isn't an ink jet — it uses a 360-dpi thermal-wax transfer mechanism built by Citizen. The thermal-wax output doesn't smear when wet, and large black areas don't mottle the paper the way liquid ink does. The WriteMove II's ink ribbon is only a bit larger than a microcassette tape. The printer supports a multistrike ribbon that you can use until it's threadbare, or a single-strike film ribbon that produces dark, crisp output. (Do stock up, though: The printer goes through ribbons like a gift wrap department.) The WriteMove II box says the printer is ideal for printing "sensitive information" (perhaps because you can hide the printer behind your back if an adversary shows up) but don't use a film ribbon for the job: Your enemies can unwind it and read everything you printed.

The WriteMove II lacks a sheet feeder: You have to hand-feed each page, and properly aligning the top of the page can be cumbersome. Also, this printer is s-l-o-w. But there's nothing smaller — and its film-ribbon output is superb.

The Apple Portable StyleWriter

The Apple Portable StyleWriter is a slightly repackaged version of a battery-powered Canon ink jet, the BJC-10sx. At an almost portly 4.5 pounds, The Portable StyleWriter is nearly twice as heavy as the WriteMove II. A sheet feeder, handy for multipage jobs, is an extra-cost option.

In Macworld Lab tests, the Portable StyleWriter was usually more than twice as slow as the StyleWriter II. The Portable StyleWriter nicely matches the look and feel of a PowerBook, but if you can do without battery operation, you will get much better performance and grayscale output from the StyleWriter II.

Portable PostScript

Mannesman-Tally's MobileWriterPS was the world's first battery-powered, portable PostScript printer. (If you don't know what PostScript is, see the section "Watch Your Language — PostScript versus QuickDraw," later in this chapter.) Weighing eight pounds, the 6-ppm, 300-dpi MobileWriterPS uses a 300-dpi thermal-transfer mechanism that holds 80 sheets of paper and prints up to six pages per minute. (With its 68000-based controller, however, don't expect to see the printer approaching that speed when printing anything but simple text documents.)

Why portable PostScript? If you use PostScript printers at the office, you're likely to have to do less reformatting when transferring a document formatted for a QuickDraw portable printer to your desktop Mac. And if you travel with PowerBook-toting co-workers, you and your cohorts can share the printer in your hotel room — or even on the plane. If you can't live without a PostScript printer at the office and if you print the same types of documents on the road, you can probably benefit from portable PostScript.

Laser Printer Details

The marriage of Mac and laser printer is a happy one — even if it does require a hefty dowry. But finding the perfect partner isn't easy. Today's laser printer shopper faces a raft of specifications and technical issues. In this section, I examine the technical processes behind laser printers and present the issues you'll want to consider when shopping for one.

Mechanics and electronics

A laser printer's output results from a collaboration between an engine and a controller. The engine is the mechanical half of the duo; it works much like a photocopier. The engine helps determine print quality and speed, and it defines how well the printer can handle different kinds of paper, such as envelopes. The controller determines the printer's typographical features — the range and quality of the fonts, styles, and the sizes it can produce — as well as its compatibility with Mac applications and with other computers.

The controller also guides the engine's imaging mechanism, telling it where to apply the *toner* powder that forms the image. And because describing the appearance of a page requires complex calculations, the controller also helps determine printer speed. In most printers, the controller is housed within the printer's case and contains its own microprocessor and memory chips. As I'll explain shortly, however, some less-expensive printers use the Mac's processor and memory as their controller.

Because the controller defines the printer's overall capabilities, your quest for the perfect printer should begin with a look at its brains.

Watch your language — PostScript versus QuickDraw

The primary difference between printer controllers lies in the type of commands they respond to. *PostScript* controllers use commands written in PostScript, a programming language created by Adobe Systems for describing the appearance of pages. A PostScript controller is a powerful computer in itself. It typically has 2MB of memory or more, a microprocessor, and ROM chips containing the PostScript language *interpreter* as well as a selection of *font outlines*, mathematical formulas the controller can use to create text in virtually any size and orientation. Examples of Apple PostScript printers include Apple's original LaserWriter and LaserWriter Plus, the LaserWriter IINT and IINTX, the LaserWriter Select 310, and the LaserWriter Pro series.

QuickDraw-based printers use the Mac as the controller, so they don't contain the complex controllers that PostScript printers require. And because QuickDraw printers make the Mac do more of the work, they generally cost less. But they often do less, too (see Table 32-1 for ten points of comparison). Relatively few QuickDraw-based laser printers are available: Apple's LaserWriter Select 300 and Personal LaserWriter 300 and GCC Technologies' PLP series. (Incidentally, many of the technical details behind QuickDraw laser printers apply to other types of QuickDraw-based printers, such as ImageWriters, StyleWriters, and Hewlett-Packard DeskWriters.)

Table 32-1
PostScript Versus Non-PostScript

PostScript	***Non-PostScript***
Processing occurs in printer, requiring complex controller, but freeing Mac for other tasks	Processing occurs in Macintosh, allowing simpler, less expensive controllers, but requiring Mac memory and hard disk space
Many font outlines stored in printer's ROM	All fonts stored on Macintosh hard disk
Background printing built into the Mac's system software	Not all QuickDraw printers support spoolers or work with the Mac's background printing feature
Printer can be shared by Macs and DOS PCs	Limited Mac sharing capabilities; no PC support
Large selection of fonts	Currently a smaller selection of fonts unless you use Adobe Type Manager
Controller can shadow text, and print along an irregular path	Some effects are not available or are application-dependent
PostScript printers are ideal proofing devices for imagesetter output	Spacing of some fonts may not match PostScript counterparts, making proofs less accurate
Can use applications that generate PostScript effects	PostScript-specific applications often produce inferior output
Most PostScript printers can also emulate other printers, such as the HP LaserJet	QuickDraw printers generally have no emulation features
Printer can be used with other PostScript-supporting computers	Printer must be used with Macintosh computers

The digital type foundry

Another important differentiating factor between printers is the font mechanism — the techniques they use to produce text. Outline fonts combined with PostScript's wide array of graphics-manipulation commands give PostScript printers tremendous typographic versatility. Need a 10-foot-high *W* filled with a checkerboard pattern? Want to produce a record label with the musician's name set in a circle, with a shadow behind it? Chores like these are a cinch for PostScript.

As described in Chapter 30, you can also supplement a PostScript printer's built-in, or *resident*, fonts with downloadable fonts, whose outlines are stored in separate files within your System Folder and downloaded to the printer's memory before printing.

QuickDraw printers can use TrueType fonts or, when paired with the Adobe Type Manager utility, Type 1 PostScript fonts. Although these printers use outline fonts, they still aren't as typographically talented as their PostScript cousins. The problem isn't the fonts, but the underlying language that positions them on the page: QuickDraw lacks PostScript's wide array of graphics operators, and because of that, QuickDraw printers still can't produce all the special text effects of their PostScript competitors.

A brighter future for QuickDraw

Things are changing. Apple's QuickDraw GX, an improved version of the basic text-and-graphics routines responsible for everything you see on the Mac's screen, promises to give QuickDraw printers greatly enhanced typographic capabilities.

Although these developments give QuickDraw printers a shot in the typographic arm, QuickDraw printers still deliver inferior results with PostScript-oriented drawing programs such as Aldus FreeHand and Adobe Illustrator — unless you use PostScript emulation software such as ColorAge's Freedom of Press (see the Background box "PostScript on a Disk").

They don't share alike

The differences between printer-driving languages are also important if you plan to share a printer with other computers. Since QuickDraw is confined to Macs, you can't use a QuickDraw printer with an IBM PC or clone.

Sharing a QuickDraw printer on a network generally isn't as easy or convenient. By contrast, every PostScript printer contains a LocalTalk connector and built-in print server software, which enables it to be used with up to 32 Macs (and PCs equipped with LocalTalk boards).

BACKGROUNDER

PostScript on a Disk

PostScript emulation software lets you overcome the language barrier between QuickDraw and PostScript. A PostScript emulator resides on your Mac's hard disk and acts as an intermediary between your application programs and a non-PostScript printer. After installing the emulator, you use the Chooser desk accessory to select its driver. Thereafter, when you issue a Print command, the emulator intercepts and saves on disk the PostScript instructions that would otherwise be sent to a PostScript printer. The emulator's PostScript interpreter then takes over, using the Mac's processor and memory to translate the PostScript into instructions your printer can understand.

Several PostScript emulation packages are available, including TeleTypesetting's T-Script, ColorAge's Freedom of Press, and PKWare's UltraScript Plus. All three support dozens of output devices, from dot-matrix printers to ink jets to lasers. (Freedom of Press Professional supports many high-end color photocopiers and printers.) One of the most interesting features provided by all three packages is the ability to act as a print server for other Macs on a network. You can use another Mac's Chooser to select the emulator's driver, and then print as though you were printing to a LaserWriter. The emulator receives the PostScript instructions over the network, and then processes the job.

A PostScript emulator can be a remarkably inexpensive way to get PostScript output, but there are other prices to pay. The emulator's performance is dependent on your Mac's. A Mac II- or Centris-class machine with a math coprocessor chip delivers acceptable performance, but lesser Macs will tax your patience. And there's always the chance that a complex PostScript document won't print: Emulators have historically had more compatibility problems than PostScript printers, including PostScript clones.

Another PostScript plus is its industry-wide support. PostScript is available on output devices ranging from laser printers to typesetters, and it's supported by a wide range of computers. PostScript's popularity lets you move files between printers or computers while retaining file formatting. For example, you can print proofs of a document on a 300 dots per inch (dpi) PostScript laser printer, and then take your file to a service bureau for output on a 2540-dpi PostScript imagesetter. Similarly, you can transfer a document created using the Mac version of PageMaker to a DOS PC running PageMaker or QuarkXPress, and its line breaks and character spacing will remain intact.

Tip: It's worth noting that Microsoft Windows supports Apple's TrueType outline fonts. Now that TrueType is firmly entrenched in both the Mac and PC worlds, exchanging documents and retaining their formatting is easier. If you're creating a document that you know will end up on the other platform, use only TrueType fonts. You're likely to have less reformatting to do.

From Screen to Printer

Every page must ultimately be described as a *bitmap* — an array of bits, each corresponding to one dot on a page. A full-page bitmap for a 300-dots-per-inch printer is roughly 1MB in size. All that data has to be stored somewhere. In PostScript printers, it's stored in the controller's *page buffer*, an area of printer memory. In QuickDraw printers, it's generally stored on the Mac's hard disk and transferred to the printer during the print job.

Printers that use outline fonts must translate those outlines into bitmaps in the type sizes needed for the page you're currently printing. Because some character bitmaps will probably be needed again later, PostScript printers store them in an area of memory called the *font cache*. Retrieving a character bitmap from the font cache is much faster than creating a new one from the outline. On a PostScript printer, a fixed amount of printer memory is reserved for the font cache. The Mac's TrueType outline font technology creates a font cache in the Mac's memory.

Other PostScript Issues

All PostScript printers are compatible with the Mac, but there can be significant differences among printers. Some questions worth asking include the following.

Does it use an Adobe interpreter?

To avoid the cost of licensing PostScript interpreters from Adobe Systems, some manufacturers have developed their own. Some of these so-called PostScript *clones* provide faster performance, but PostScript is a complex language and incompatibilities can arise, especially if you print complex illustrations created with programs such as FreeHand or Illustrator. If you print typographically simple documents such as memos, manuscripts, and legal contracts, you may never encounter problems. (Of course, if you print simple documents, you may not need a PostScript printer to begin with.)

I used to have serious reservations about PostScript clones, but today's machines have fewer problems than their predecessors. In the past, PostScript clones had major problems handling Type 1 downloadable fonts, the downloadable font format used by Adobe and many other font developers. Type 1 fonts contain instructions that the printer's controller uses to optimize the appearance of each character at a given size. These instructions, called *hints,* are encrypted, and clone developers were loath to crack the code, fearing lawsuits from Adobe. Adobe has since published the Type 1 specifications, however, so today's PostScript clone interpreters can, well, take the hints. The latest high-resolution engines help sharpen their text output, too.

Is it a Level 1 or Level 2 interpreter?

Apple, Texas Instruments, Dataproducts, Hewlett-Packard, and others have adopted Level 2 PostScript. Level 2 PostScript offers several advantages over Level 1. Among other things, it uses a printer's memory more efficiently; it provides image decompression features that reduce printing times; and it allows for faster print jobs by storing, or *caching*, elements that repeat on each page. Level 2 also provides significant features for color printing, including support for multiple *color rendering dictionaries* — sets of data that tell a printer how to produce various colors.

For a couple of years, most of Level 2's advantages were only theoretical — the Mac's printer driver didn't take advantage of them. Now that Apple and Adobe have shipped the PSPrinter driver (also known as LaserWriter 8), the Mac can take better advantage of Level 2 machines. (See Chapter 30 for more details on the PSPrinter driver.)

How much memory is provided?

Most PostScript laser printers provide 2MB to 5MB of memory, divided into three areas — the page buffer, the font cache, and *virtual memory*, or *VM* — general work space that also holds downloadable fonts. (By the way, virtual memory as it applies to PostScript printers is unrelated to System 7's virtual memory feature.) The font cache holds the bitmaps for characters that have already been printed on a page. When the font cache fills — which can happen when you print a document with a large mix of type styles and sizes — the controller must purge some of the character bitmaps it has laboriously created, and then create the new ones it needs.

If the purged characters are needed again, the controller must recreate their bit maps from the font's outlines. The more memory a printer provides, the larger its font cache and VM. A larger font cache means faster performance, and more VM means more room for downloadable fonts. Many printers also accept memory-expansion options.

QUICK TIPS

TrueType and Multiple Master Fonts Need More Memory

No matter which PostScript printer you choose, if you plan to print TrueType or Adobe Multiple Master fonts, consider a model that provides (or can be upgraded to) at least 3MB of memory. Just as today's larger programs demand more memory from a Mac, the latest font technologies require more memory in a printer.

And to think that the February 1985 issue of *Macworld* magazine called the original LaserWriter's 1.5MB "an enormous amount."

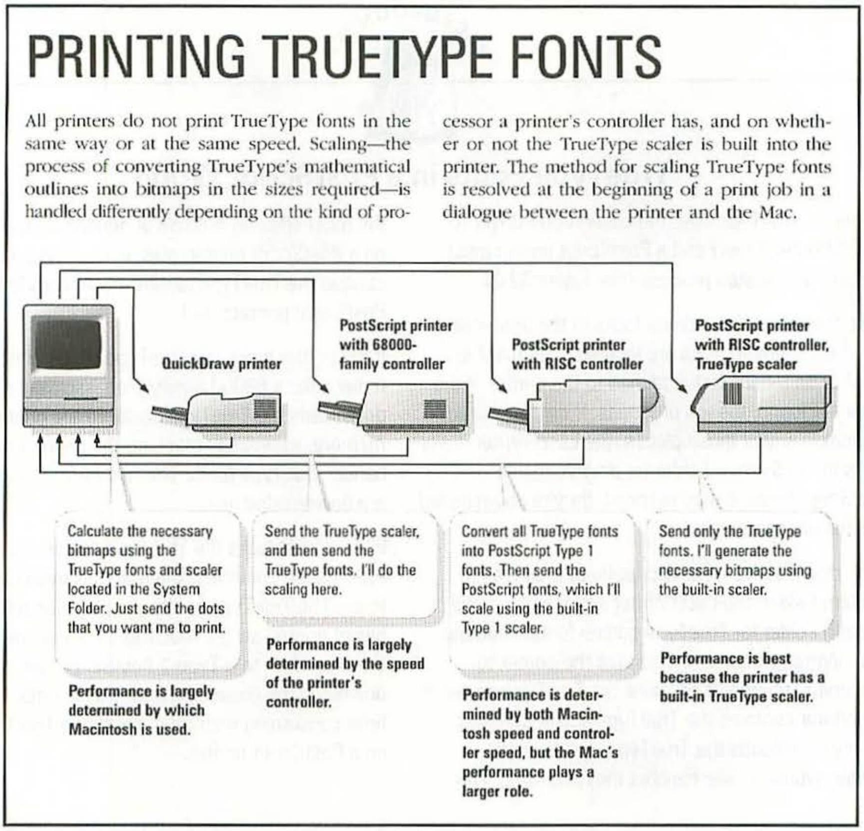
Does it have a RISC chip?

Some PostScript controllers still use 68000-family processors, but a growing number use high-speed *RISC* (reduced instruction-set computer) processors whose internal architecture is streamlined for top performance. If you print complex documents containing illustrations, scanned images, and scads of type sizes and styles — elements that make a controller sweat — look for a RISC-based printer.

How does it handle TrueType fonts?

Before an outline font can be printed (or displayed, for that matter), the outline must be translated into a bitmap of the point size required. This job is performed by a piece of software called a *rasterizer*, also called a *scaler*. Adobe's Adobe Type Manager utility is the best-known rasterizer; Apple's TrueType also contains its own scaler. A PostScript printer performs its own rasterizing; with QuickDraw printers, the Mac does the rasterizing.

Although PostScript and TrueType both rely on outline fonts, each uses a different format of outline and thus requires its own rasterizer. Because of these dueling font formats, the Mac must perform some extra effort in order to print a TrueType font on a PostScript printer (see Figure 32-3 "Printing TrueType Fonts" and the Background box "TrueType Fonts in a PostScript World"). Don't feel like you have to memorize every step described in this box — there isn't a quiz at the end of this chapter. What's important to remember is this: If you plan to frequently print TrueType fonts on a PostScript printer, look for a printer containing the TrueType rasterizer.



PRINTING TRUETYPE FONTS

All printers do not print TrueType fonts in the same way or at the same speed. Scaling—the process of converting TrueType's mathematical outlines into bitmaps in the sizes required—is handled differently depending on the kind of processor a printer's controller has, and on whether or not the TrueType scaler is built into the printer. The method for scaling TrueType fonts is resolved at the beginning of a print job in a dialogue between the printer and the Mac.

QuickDraw printer
PostScript printer with 68000-family controller
PostScript printer with RISC controller
PostScript printer with RISC controller, TrueType scaler
Calculate the necessary bitmaps using the TrueType fonts and scaler located in the System Folder. Just send the dots that you want me to print.
Performance is largely determined by which Macintosh is used.
Send the TrueType scaler, and then send the TrueType fonts. I'll do the scaling here.
Performance is largely determined by the speed of the printer's controller.
Convert all TrueType fonts into PostScript Type 1 fonts. Then send the PostScript fonts, which I'll scale using the built-in Type 1 scaler.
Performance is determined by both Macintosh speed and controller speed, but the Mac's performance plays a larger role.
Send only the TrueType fonts. I'll generate the necessary bitmaps using the built-in scaler.
Performance is best because the printer has a built-in TrueType scaler.

Figure 32-3: Printing TrueType Fonts

Can it accept a hard disk?

Some printers can accept an optional SCSI hard disk. A hard disk attached to a printer stores downloadable fonts, making them available to all machines on a network and eliminating downloading time (20–30 seconds per font). A hard disk also acts as an extension to the font cache, which further improves printer performance.

Can it imitate other printers?

Older software for IBM PCs and other computers may not support PostScript, but it generally does support letter-quality printers or Hewlett-Packard LaserJets. Most PostScript printers provide emulation modes that enable them to respond to commands for such printers. If emulation modes are important to you, look for a

BACKGROUNDER

TrueType Fonts in a PostScript World

To print a TrueType font, the LaserWriter driver (or the PSPrinter driver) and a PostScript printer must perform a multistep process (see Figure 32-3).

First, the LaserWriter driver looks in the printer to see if the required fonts are located in its RAM or ROM or on a hard disk attached to the printer. If the fonts are found, the job proceeds. If the fonts aren't present in any of those places, the LaserWriter driver looks in the System Folder for downloadable PostScript fonts. If they're found, they're downloaded and the job continues.

If the downloadable PostScript fonts aren't in the System Folder, the LaserWriter driver looks in the System Folder for TrueType outline fonts. Then the LaserWriter printer driver queries the printer to determine whether it contains the TrueType scaler. If the printer contains the TrueType scaler, the Mac simply downloads the TrueType outline to the printer, whose scaler handles the rasterizing. This is the most efficient method of printing a TrueType font on a PostScript printer; alas, only a few printers contain the TrueType rasterizer. (Apple's latest PostScript printers do.)

If the printer lacks the TrueType scaler and its controller uses a 68000-family processor, the Mac downloads the TrueType scaler to the printer's memory, essentially teaching the printer how to handle TrueType fonts. The font outlines themselves are downloaded next.

If the printer lacks the TrueType scaler and has a RISC-based controller, the Mac has even more work to do. The TrueType scaler won't run on a RISC-based printer, so the Mac must convert the TrueType font to a Type 1 PostScript font, and then download the converted font. This is often the most time-consuming method of printing a TrueType font on a PostScript printer.

printer that provides *automatic emulation sensing*, such as the QMS 420 Print System. Emulation sensing enables a printer to switch into an emulation mode when it determines that incoming data isn't PostScript code. Without emulation sensing, you need to flick a switch or use a printer's front-panel buttons to switch between PostScript and emulation modes.

What ports does it provide?

All PostScript printers provide a LocalTalk port for connecting to Macs and LocalTalk-equipped IBM PCs (and compatibles). Most PostScript printers also provide RS-232C serial ports; some also have Centronics parallel ports — the dominant printer port in the IBM world. To use the printer with computers lacking LocalTalk, you need one of the latter two ports. A growing number of PostScript printers also include or accept optional Ethernet connectors for tapping into high-speed networks.

Does it accept a fax modem board?

Compaq's Pagemarq series and NEC's SilentWriter series are among the PostScript printers that accept an optional PostScript fax modem board. With a fax board, you can send documents to any standard fax machine; if you send them to another printer equipped with a PostScript fax board, the documents are printed at full resolution using fonts present in the destination printer — no fax jaggies. The received fax looks as if you printed it from a Mac on your own network. It's remote printing without the snail-like performance provided by modems and software such as AppleTalk Remote Access. Note that the board doesn't give the printer scanning capabilities, so you can't send faxes of hard copy documents.

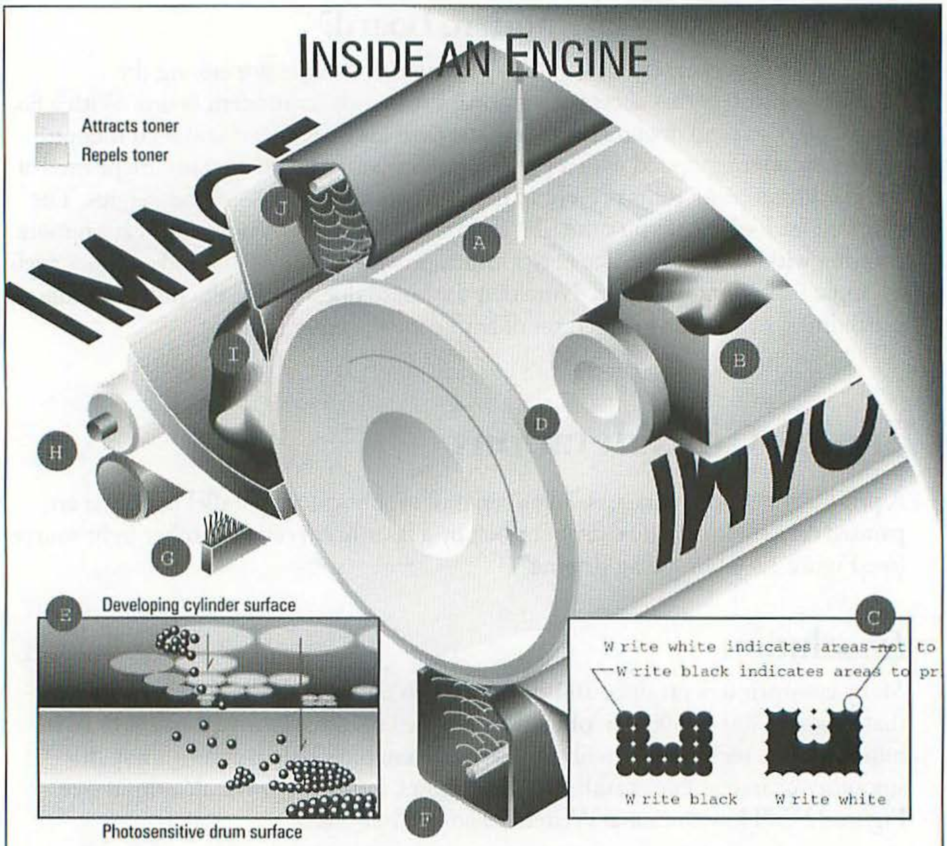
Print Engine Considerations

A print engine forms images using a series of evenly spaced parallel lines that are painted on a photosensitive drum or belt by a laser beam or some other light source (see Figure 32-4 "Inside an Engine").

Resolution

Many laser printers produce 300-dots-per-inch output, but the trend is printers that produce 400 or 600 dpi, often through the use of *resolution enhancement* techniques. These techniques involve finessing an engine's laser beam in a way that smoothes character edges and, in some printers, improves grayscale output (see Figure 32-5 "How the LaserWriters Change Their Dots").

Hewlett-Packard's Resolution Enhancement Technology (RET) came first. Apple fired back in 1991 with its FinePrint and PhotoGrade technologies, which improve the appearance of character edges and halftoned images, respectively. (Hewlett-Packard's RET doesn't improve halftones.) These days, 600-dpi printers that offer resolution enhancement are available from many companies, including Apple, HP, Lexmark International (an IBM-spinoff), NewGen Systems, Xante, and others. HP's LaserJet 4 series and Apple's LaserWriter Pro line use the 8-ppm versions of Canon's EX print engine, whose maximum page size is 8½ by 14 inches. HP, QMS, NewGen Systems, and others also sell 600-dpi printers that use the larger BX engine, which supports 11 by 17-inch paper. Both engines are also available in 400-dpi versions.


INSIDE AN ENGINE
Attracts toner
Repels toner
A
B
C
D
E
F
G
H
I
J
Developing cylinder surface
Photosensitive drum surface
Write white indicates areas not to
Write black indicates areas to pr
Write black
Write white

With the bitmapped image of the page as a guide, the engine uses a light source (usually a laser) to expose its photosensitive drum or belt **(A)**. In a write-black engine (shown here), the areas to be printed have an electrical charge that attracts toner as the drum rotates past the toner compartment **(B)**. In a write-white engine, the areas not to be printed have a charge that repels toner. Because written-to areas are not completely solid, write-white engines produce more solid blacks **(C)**. When the drum meets the developing cylinder **(D)**, charged toner particles are attracted to areas of the drum that have an opposite charge **(E)**. An electrically charged wire attracts toner from the drum onto the paper **(F)**. After a discharge brush removes all electrical charges from the paper **(G)**, heat rollers fuse toner to the paper **(H)**. A cleaning blade removes any remaining toner from the drum **(I)**, and a second wire neutralizes the drum's electrical charge **(J)** so that it may be written to again.

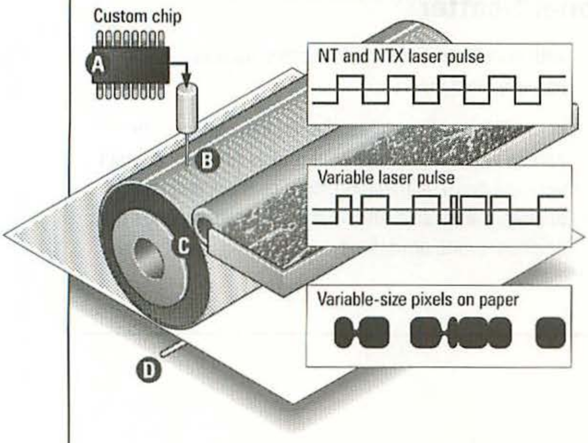
Figure 32-4: Inside an Engine

Engine speed

Most laser engines can push paper at a pace of between 4 and 20 pages per minute (ppm). In many cases, however, you see these speeds only when printing multiple copies of the same document or very simple documents such as manuscripts in the Courier font. With documents containing graphics or several fonts and sizes, performance is often limited by the printer's controller, not its engine.

HOW THE LASERWRITERS CHANGE THEIR DOTS

Many of today's laser printers have the ability to enhance the appearance of black-and-white images by controlling the duration or the pulse-rate of the laser beam. Below is an illustration of how Apple's FinePrint and PhotoGrade use this technique to create variable-size pixels.



A) The top inset box shows how the older LaserWriter NT and NTX use a constant pulse rate, which results in identically sized pixels. FinePrint and PhotoGrade use a variable pulse rate (middle box) to produce pixels of varying size (bottom box).

B) At any spot where the laser exposes the photosensitive drum, the drum becomes positively charged. Since the laser can pulse at a variable rate, charged areas on the drum can vary in size. Shorter laser pulses create smaller charged areas.

C) Charged areas attract toner as the drum rotates past the toner compartment. Smaller charged areas attract fewer toner particles, creating smaller dots.

D) A charged wire attracts toner from the drum onto the paper. Toner particles also have a tendency to stick together, and merge with each other—further smoothing out lines and gradations.

PhotoGrade: Getting More Grays

Apple's PhotoGrade technology uses irregular laser pulses to sculpt pixels and simulate gray shades. An older PhotoGrade-capable printer such as the LaserWriter IIf or IIg can simulate up to 67 gray shades. In these printers, the PhotoGrade chip combines 8 pixels into a pinwheel-shape halftone cell (shown at right). Because of their higher resolution, the 600-dpi LaserWriter Pro 600 and 630 can simulate more than 91 levels of gray.

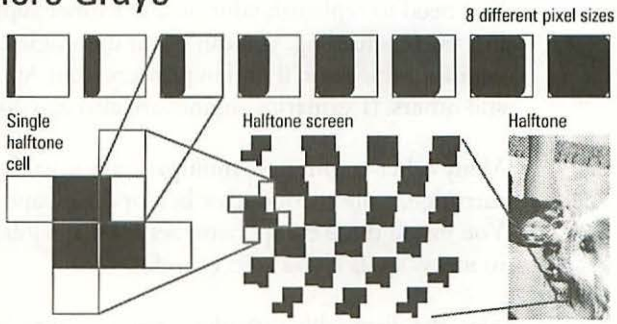


Figure 32-5: How the LaserWriters Change Their Dots

Engine life

If you churn out hundreds of copies of documents or share a printer in a busy office, you need an engine designed to take a beating and keep on feeding. Two specifications refer to an engine's durability — *engine life*, measured in pages; and *duty cycle*, the number of pages you can print per month. Heavy-duty printers have duty cycles in the 40,000-page-per-month range. If you exceed the recommended duty cycle rating, you're asking for mechanical trouble.

BACKGROUNDER

No More Toner Scatter

The output from the new Canon engines is not only sharper, it's also cleaner. One classic problem with laser output is that character edges are often slightly fuzzy, surrounded by a haze of stray toner particles. This toner scatter occurs because of stray electrical charges generated by a relatively imprecise corona wire, the component that attracts toner from the photoconductive drum to the paper. Toner scatter causes small type to appear heavy and overexposed, with hollow portions of characters such as *e* and *b* partially filled in.

In the EX and BX engines, Canon has replaced the corona wire with a roller that makes physical contact with the drum, eliminating stray charges and toner scatter. Canon says the new design also reduces the engines' ozone emissions.

Ease of feeding

You need to replenish your printer's toner supply every few thousand pages or so. For no-fuss feeding, you can't beat the single-cartridge system used in Canon-built engines, which you'll find in printers from Apple, Canon, QMS, Hewlett-Packard, and others. (Lexmark's engines are also easy to set up.)

Many other engines use multipart consumables kits, which may comprise a toner cartridge, a photoconductor belt or drum, and a small bottle that holds used toner. You install these components separately, a job that isn't difficult, but that can lead to messy spills if you aren't careful.

Alas, the disposable cartridges used in Canon engines are an environmentalist's nightmare, each contributing several pounds of plastic to the local landfill. Happily, you can recycle cartridges — and save money in the process — by sending them to one of the growing number of cartridge remanufacturing services (see the Quick Tips box "Saving Green").

Paper handling

The features an engine provides for storing and feeding paper break down into several categories — maximum page size (usually 8½ by 14 inches); paper capacity (from 100 to 1,000 sheets); number of paper trays (usually one, sometimes two or three); and manual-feed features. If you plan to feed envelopes or other nonstand-

QUICK TIPS

Saving Green

A used toner cartridge isn't used up — many of its internal parts are good for tens of thousands of pages. By reusing or recycling toner cartridges, you can at least postpone all that plastic's journey into forever.

Toner cartridge remanufacturers disassemble cartridges, clean and replace parts as needed, and then replenish their toner supply — for about half of what new cartridges cost. Many remanufacturers are starting to handle non-Canon toner cartridges, too. Using a recycled cartridge won't void your printer's warranty, degrade print quality, or hurt your printer.

If you choose a reputable recycler, that is. Some fly-by-night operations simply drill a hole in the cartridge and fill it with toner — an approach that invites poor output quality at best, and printer damage at worst. Ask for recommendations at a user group or desktop publishing service bureau, or ask a remanufacturer for references.

If you still prefer to buy brand-new cartridges, at least consider recycling your spent ones. Hewlett-Packard, Apple, Lexmark, Compaq, and other firms have cartridge recycling programs that usually involve returning the spent cartridge to the manufacturer using a postage-paid label included with the cartridge.

ard paper sizes frequently, look for a printer that offers a *self-centering* manual-feed slot. Such slots use two adjustable guides; move one, and the other moves accordingly.

Picking Your Printer

Should you buy a PostScript printer? Will a clone suffice? Or should you buy a QuickDraw-based printer?

Adobe Type Manager, Apple's TrueType, and QuickDraw GX, give QuickDraw printers greatly improved typographic features. If you don't need networking features, you don't use PostScript-oriented drawing programs, and you don't need to exchange formatted documents with other types of computers, a QuickDraw printer is probably a good choice. If you need to share a printer — especially between Macs and PCs — go for PostScript.

BACKGROUNDER

Talking to PC Printers

Laser (and ink jet) printers designed for the IBM PC world often cost considerably less than their Mac-specific cousins. If you're willing to stray from the pack, you can use one of these PC printers with a Mac. All you need is the proper cable and driver software that the PC printer can understand.

Three such packages are GDT Softworks' PowerPrint, Orange Micro's Grappler IIsp, or Insight Development's MacPrint. These packages essentially turn PC-oriented printers into QuickDraw printers; all are also compatible with ATM and TrueType.

GDT's PowerPrint is the best of the three, supporting a far greater number of printers as well as offering features similar to those provided by Apple's PostScript driver, such as the ability to invert a page (turn black to white and vice versa). PowerPrint could be a godsend for nomadic PowerBook owners: Take along a cable and you may be able to connect to any printer you encounter.

In the past, third-party PC printer drivers have had serious application compatibility problems. Most problems were caused by application developers that disregarded Apple's programming guidelines by assuming their programs would never print to anything but an ImageWriter or a PostScript-based LaserWriter. Now that QuickDraw-based laser and ink jet printers are popular, most application developers have wised up and stopped making such assumptions. But you'll still find some warnings and workarounds in the PowerPrint manual, so it's wise to verify compatibility with your favorite programs before you buy.

Focus on Color Printers

Most people rely on monochrome printers for their day-to-day work, but more and more are buying color machines — to proof publications, create package mock-ups, print scanned or video-captured images, produce overhead transparencies, and just punch up their documents.

The increasing interest in color isn't surprising. Color printer prices have never been lower and print quality has never been better. The complex hardware and software required to accurately mix and apply pigments continue to mature: Today's color consumers need not feel like pioneers chasing rainbows. In this section, I describe the technologies and issues behind color printing.

Color printer basics

There are many ways to put color on paper, but all involve applying pigments in three colors — cyan, yellow, and magenta. These *primary colors* can be mixed to produce other colors. Equal amounts of cyan and yellow, for example, produce green, and equal amounts of magenta and cyan make blue. Equal amounts of all three primaries produce black, although many printers apply a separate black pigment to obtain richer blacks. This technique of mixing cyan, yellow, and magenta to produce colors and also applying black where needed is called *CMYK* or *process* color (the *K* stands for black). Color printing presses also produce their output by using the same four ink colors — which is why they're often described as four-color presses.

A color printer's pigments can take several forms, from liquid ink that is sprayed through microscopic nozzles to solid wax that is melted onto the page by heated rollers. Because of this variety of technologies, color printers are categorized according to the makeup of their pigments — ink jet and *phase change* ink jet printers, *thermal wax transfer* printers, and *dye sublimation* printers. There are even a few color laser printers with powdered toner in four colors — guess which four. (For a look at how various color printing technologies work, see Figure 32-6 "Color Printer Technologies Illustrated.")

Pigments and dots

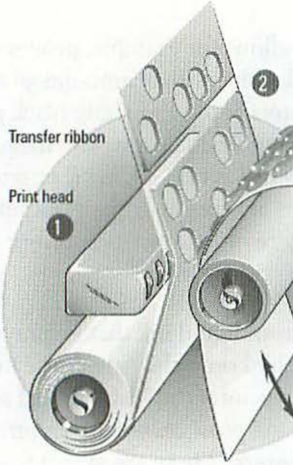
You might have the idea that a color printer mixes pigments in the quantities needed for a given color and then applies that color to the page. Not so. Instead, most printers overlay dots of whichever primary colors are needed: To print a red dot, the printer overlays one yellow and one magenta dot. With this scheme, red, green, and blue dots are easy to create: The printer just applies equal amounts of two primaries. So, a color printer can easily produce eight colors — cyan, yellow, magenta, black, red, green, blue, and white. (To produce white, the printer applies no pigments at all — thus, its white is only as white as the paper you use.)

What about the rest of the spectrum? Ideally, a color printer could create other colors by applying pigments in unequal amounts — for example, a lot of magenta and just a tad of cyan. Some high-end color printers can do just that, but the majority have just one dot size. To produce colors other than the eight just listed, they must resort to dithering — that patterning process I described back in Chapter 14.

How color dithering works

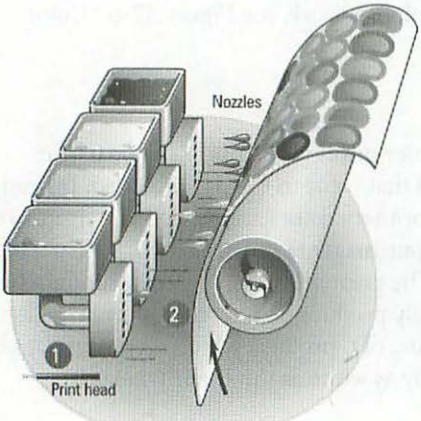
Dithering involves applying cyan, yellow, magenta, and black dots in complex patterns that trick the eye into seeing other hues. But the eye isn't that easily fooled. Dithering results in impure colors, and it can give color output a speckled look — as if you tried to tone down a bright paint by sprinkling pepper on it. What's more, the quality of the dither patterns — the arrangements of colored dots — can vary from one printer vendor to the next.

COLOR PRINTER TECHNOLOGIES ILLUSTRATED



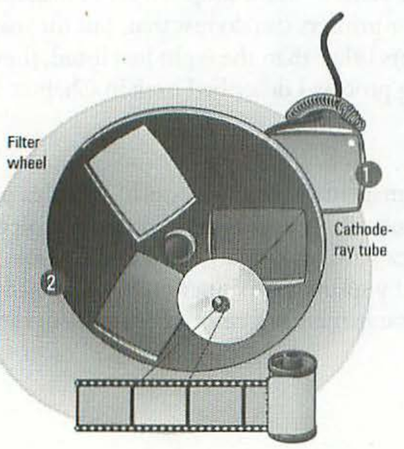
Thermal-Wax Transfer Printer

A thermal-wax transfer printer, such as Seiko's ColorPoint and QMS's ColorScript 100, contains a roll of transfer ribbon on which wax-based pigments in each process color (cyan, magenta, yellow, and black) are positioned one after another. The transfer ribbon is sandwiched between the print head, which contains thousands of heating elements, and the paper (1). The print head's heating elements are turned on and off to melt the wax as needed, causing individual dots to adhere to the paper (2). The paper passes by the ribbon and the print head four times, once for each process color.



Ink-Jet Printer

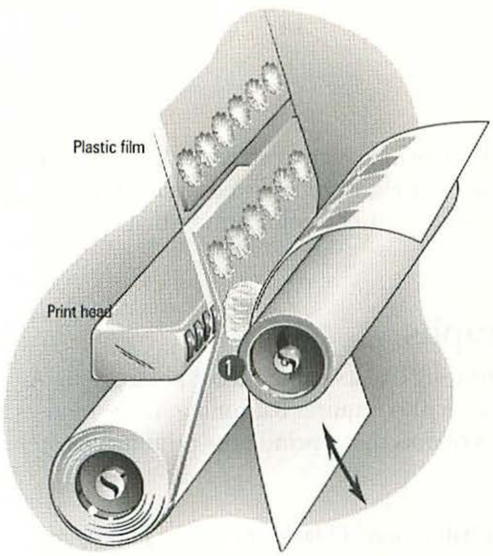
A color ink-jet printer sprays drops of ink onto the page through microscopic nozzles in the printer's print head. To spray a drop of ink, some ink-jet printers send an electronic signal to a piezoelectric diaphragm within the head (1), forcing a drop of ink from the nozzles (2). Others, such as Hewlett-Packard's HP DeskWriter and the Apple Color Printer, use a heating element to create bubbles that expand, forcing drops of ink from the print head. Because an ink-jet printer lays down all four colors in one pass, it poses fewer registration problems than do multipass printers.



Film Recorder

Unlike a printer, a film recorder uses red, green, and blue light to produce images on 35mm slide film. A controller board translates commands from the Mac into video signals and sends them to a high-resolution monochrome cathode-ray tube (1). A filter wheel (2) rotates to produce the required amount of each primary color, which travels through a lens and into a camera adapter that attaches to the front of the film recorder. With the proper adapter, a film recorder can also accept 4-by-5-inch Polaroid print or transparency film.

Figure 32-6: Color Printing Technologies Illustrated

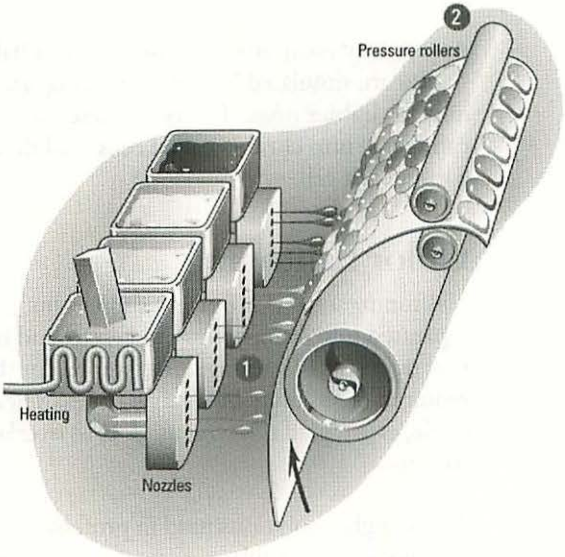


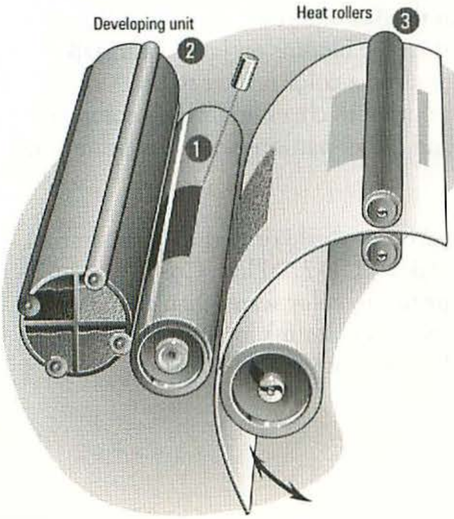
Dye Sublimation

Dye-sublimation printers pass plastic film coated with cyan, magenta, yellow, and black (C, M, Y, and K) dye across a print head containing about 2400 heating elements. This dye goes from solid to gaseous form when heated (1). Coated paper, designed to absorb the gaseous dye on contact, passes across the film four times (once per color) as it contacts the print head. Each heating element can produce 255 different temperatures—the hotter, the more dye is transferred. This variable dye density produces continuous-tone images.

Phase Change Ink Jet

Phase-change printers melt blocks of C-, M-, Y-, and K-color wax in ink reservoirs. The melted ink is sprayed onto the page through tiny perforations in print-head nozzles (1), in a single pass, as with typical ink-jet printers. Unlike the water-based inks used in typical ink jets, the wax-based inks in solid-ink printers solidify on the page very quickly, inhibiting absorption that can reduce image sharpness. This allows phase-change ink jet printers to use relatively absorbent plain paper. High-pressure rollers then flatten the dots and fuse them to the page (2).





Color Laser

Color laser printers use a four-chamber developing unit that holds colored (C, M, Y, and K) plastic toner powder. After a light source exposes an image on a photosensitive drum (1), exposed portions of the drum take on an electrical charge that attracts toner as the drum rotates past the developing unit (2). This process is repeated four times, once for each color. After each exposure, the paper passes across the toner-coated drum. When the four passes are completed, heated rollers fuse the toner to the page (3).

Figure 32-6: Color Printing Technologies Illustrated *(continued)*

If you're printing pie charts, text, and line drawings such as architectural diagrams, you can avoid dithering by using only the basic eight colors listed earlier. Otherwise, there's no escaping it — except to buy a high-end color printer that can produce continuous-tone images.

The challenge of photographs

Nothing pushes the envelope of color printing like a scanned color photograph. A scan not only requires extensive dithering, it also requires halftoning: Its continuous tones must be converted into a series of dots that a printer (or printing press) can produce.

As you may recall from Chapter 14, in a halftone of a black-and-white photo, gray shades are simulated by dots of varying size — larger dots for darker grays, smaller dots for lighter ones. To create these dots, a printer combines the smallest dots it can create into clusters called cells, and then turns on varying numbers of dots within each cell.

Color halftoning

Halftoning a color image is a similar, but trickier, process. First, the image must be separated into cyan, yellow, magenta, and black components; each resulting separation uses dots of varying size to represent the amount of each primary color required to simulate the image's hues. Then each screen is rotated to a different angle, causing all the screens' dots to overlap and form sets of small circles called rosettes.

At the high resolutions used in professional printing, these rosettes are small enough to be invisible at normal reading distances. (You can see them if you try; look closely at the cover of this book.) But at the 300-dpi resolution provided by most color printers, the rosettes are bigger than the blooms on Jack's beanstalk. You may not mind this chunky look if you're using a color printer to produce rough mockups. But if you're printing color output to check an image's color balance, the fat rosettes, plump halftone dots, and dither patterns will complicate your job by obscuring image details.

These drawbacks aren't present in the film recorder world or in the upper stratum of color printing, where printers such as Kodak's XLT-7700 live. Costly dye-sublimation color printers can do jaw-dropping justice to color scans, thanks to their translucent pigments. The five-figure Iris SmartJet color ink jet printer also handles photos beautifully, thanks to its ability to print variable-size dots.

From Screen to Paper — Matching Woes

If you think the muddy waters of rosettes and screen angles are sloppy, put on your hip boots. One of the most complicated aspects of color output involves matching the colors you see on the screen with the colors your printer produces. This isn't critical for presentations and simple color-coding applications: Who cares if a printed bar chart's hues differ from what you saw on the screen?

But color matching is essential for color publishing. When publishers specify certain colors for a design or spend hours tweaking the color in scanned photographs, they want the final printed output to match what they saw on their screens. Publishers also need printers that can accurately reproduce colors in printing industry color-specification systems such as Pantone and Trumatch.

One problem behind screen-to-printer matching is that monitors and printers use different ingredients to mix their colors. Printers use cyan, yellow, magenta, and black pigments, and monitors use red, green, and blue light. Printing inks create colors by absorbing, or subtracting, light reflected from paper; monitors create colors by adding light to a screen. In color jargon, printers use a *subtractive color model* (the CMYK model), and monitors use an *additive color model* (the *RGB* model).

Converting between color models

Because of this fundamental difference, documents you print must often go through a transformation process in which their RGB colors are translated into CMYK counterparts. But the phrase "something got lost in the translation" can apply to color transformations as readily as it does to language. Printers can't produce the same range of colors you see on the screen — technically speaking, they have different *color gamuts.* As a result, when you print an image, its RGB colors must be converted, or mapped, to their closest available CMYK colors. The result: The color that prints isn't what you saw on screen.

The paper used for printing is another variable in color matching. Paper isn't always completely white, and any tint is going to alter colors by changing the way light is reflected. But this isn't a serious issue for most color printers, because most require that you use the manufacturer's paper. (Where plain-paper output is concerned, color printer vendors are being pulled from two sides. Business people want to be able to print charts and graphs on company stationery, but publishers need a pure white stock that provides consistent output.)

Other color-matching snags

Other problems in color matching arise even before your output meets the printed page. Monitors themselves vary. An image displayed on your monitor is likely to look different on your coworkers' monitors — for that matter, it may look different on *your* monitor a month from now.

Over the years, numerous firms, including Kodak and Electronics for Imaging (EFI), have developed color-management systems — software, and in some cases, calibration hardware — that promise greater fidelity between the screen and the printed page.

For screen-to-printer matching, Apple may be the final arbiter. Its ColorSync extension to the Mac's System software enables developers of printers, scanners, and monitors to create *device profiles* that describe their hardware's color characteristics. ColorSync then works with application programs to adjust colors as they journey from one device to another.

Color-management systems such as ColorSync are often paired with color calibration hardware such as Kodak's ColorSense. A calibrator uses an optical sensor that attaches to the front of a display. The sensor enables the Mac to compare the color a monitor is producing to the color the Mac's video signals are telling it to produce. If there are variations — and there probably will be — the calibrator's software can adjust the video signals to compensate, enabling the display to produce the colors it's supposed to.

Color Printer Shopping Considerations

Grouping color printers into the general categories — ink jet, thermal wax, and dye-sublimation — is convenient for price and basic comparisons, but your shopping list needs to address other things, too. Here's an overview of the key issues to examine.

Media flexibility

Want to print on plain paper? Forget dye-sublimation printers: They require special, expensive paper designed to absorb the printer's dyes. The latest liquid ink jets can print on plain paper, but the results can look splotchy — like a fountain pen writing on a paper towel. Only a few thermal wax printers from Tektronix, QMS, NEC, and Seiko can print on plain paper, and even these require premium laser bond such as Hammermill Laser Print. Most thermal wax printers use a lightweight coated paper that feels flimsy. If you want the kind of plain paper support that monochrome laser printers provide — the ability to feed everything from letterhead to card stock — you'll need to consider a solid ink jet printer such as Tektronix Phaser IIIPXi or a color laser printer such as the QMS ColorScript Laser 1000.

For many people, printing color business letters isn't nearly as important as printing color overhead transparencies for presentations. All color printers can print on transparency film, but in general, thermal wax machines produce the best results.

The finish and durability of output varies from one technology to another. Liquid ink jet output smears when wet. Solid ink jet output has a textured matte finish that can crack after repeated folding. Thermal wax gives printed areas of the page an appealing gloss. Pages from a dye-sublimation printer are glossy all over.

PostScript and QuickDraw in living color

In the Mac world, buying any kind of printer means choosing between one that uses PostScript, the page-description language of desktop publishing, or buying one that relies on QuickDraw, the Mac's built-in software for creating text and graphics. A PostScript printer contains its own computer, or controller, that interprets PostScript-language commands coming from the Mac and translates them into the dots that form the printed image. A QuickDraw printer, on the other hand, relies on the Mac to perform the calculations required to print a page. As a result, QuickDraw color printers cost less.

Networking features

When buying a color printer for the office, you probably want each Mac — and perhaps also your DOS PCs — to be able to access the printer. PostScript and networking go hand-in-hand: All PostScript printers provide a LocalTalk port for connecting Macs and LocalTalk-equipped DOS PCs. A growing number of printers also include or accept optional Ethernet ports that transfer data many times faster than LocalTalk. If you plan to print large scanned images frequently, look for Ethernet capability.

If you plan to print from DOS PCs as well as Macs and you don't want to buy LocalTalk boards for the PCs, look for a printer that offers an *all ports active* feature. With such a feature, all the ports are always listening for data; when a print job arrives at one port, other ports are temporarily disabled. The benefit: You need not flick switches to tell the printer which port to use. Some printers from QMS, Seiko, and others, provide an even better variation — the ability to temporarily store incoming jobs on the printer's hard disk, enabling the printer to accept jobs from various ports at the same time. This doesn't make the printer any faster, but it can help your Mac and network run faster. As for QuickDraw printers, most can be shared on a network.

Speed

Color printer performance is often measured in minutes per page, not pages per minute. Producing color output requires additional processing time, as the controller — whether built-in or Mac-based — figures out how much cyan, yellow, magenta, and black ink to apply in order to create various hues. For QuickDraw printers, this means that the faster your Mac, the faster the printer.

The actual printing takes longer, too. In ink jet printers, a print head skitters from left to right, painting the page in narrow passes. Thermal wax and dye-sublimation printers — which heat dye-impregnated film to transfer color to paper — are much faster, but are still slower than monochrome lasers.

Time to Buy a Color Printer?

Between falling prices, rising quality, and the availability of system-level color management, desktop color printers are closer than ever to entering the mainstream of personal-computer peripherals.

Still, it will be some time before color printers become as common as color monitors. One reason is cost: Today's color printers are slower and more expensive to buy and operate than monochrome printers.

Another reason is practical: Many of the documents produced in businesses are photocopied for distribution, and the vast majority of copiers are color blind. Adding color charts or diagrams to a multipage report means printing the color pages separately and then collating them into the final product — a labor-intensive job.

There may come a time when you won't think about buying a color printer any more than you think about buying a color television. Until then, color printers will remain specialized printers primarily for publishers and presenters. The good news for these groups is that the latest batch of machines is the best ever. Color printers may not have entered the mainstream yet, but they are most definitely making waves.

CHAPTER 32 CONCEPTS AND TERMS

- Ink jet printers cost less than laser printers, but their output quality is inferior.
- A laser printer generally has two basic components — an engine, the photocopier-like mechanism that transfers toner to paper; and a controller, the circuitry that accepts commands from the Mac and governs the engine.
- In a QuickDraw printer, the Mac serves as the controller. This reduces the printer's cost, but means the Mac must act as the controller.
- A QuickDraw printer can't be used with a DOS PC. Also, most QuickDraw printers aren't as easy to share on a network as PostScript machines.
- The three predominant color printer technologies are ink jet (good), thermal-wax transfer (better), and dye-sublimation (best).
- Dye-sublimation printers are best for printing scanned photographs because they can produce continuous-tone images. Other color printers must resort to dithering.
- Color management software such as Apple's ColorSync is designed to enable printed colors to match those displayed on the screen.

additive color
The process of creating colors by projecting colored light. With additive color, the three primary colors are red, green, and blue.

all ports active
A printer feature in which all the connection ports are always listening for data; when a print job arrives at one port, other ports are temporarily disabled.

CMYK
An abbreviation for *cyan, magenta, yellow,* and *black,* the four process colors used in the color printer world.

color gamut
The range of hues a color printer can produce.

controller
The printer circuitry that governs the engine according to commands received by the Mac. In QuickDraw printers, the Mac acts as the controller.

device profile
A description of the color-rendering capabilities of a given device, such as a monitor or printer. Color-management systems such as Apple's ColorSync use device profiles.

downloadable font
A PostScript font whose outline is stored in your System Folder and downloaded to the printer's memory before printing.

duty cycle
A print engine specification that describes the maximum number of pages you can print per month without risking mechanical problems.

emulation modes
Special operating modes provided by some PostScript printers that enable a printer to imitate a non-PostScript printer.

emulation sensing
A feature provided by some PostScript printers that enables a printer to switch into an emulation mode when it determines that incoming data isn't PostScript code. Without emulation sensing, you need to flick a switch or use a printer's front-panel buttons to switch between PostScript and emulation modes.

engine
The printer mechanism that transfers toner, ink, wax, or dye to paper.

font cache
In a PostScript printer, an area of controller memory that stores already rasterized fonts in the likely event they will be needed again in that document. TrueType creates a font cache in the Mac's memory.

font outlines
Mathematical formulas the Mac or a printer can use to create text in virtually any size and orientation.

GrayShare
An Apple printer driver technology that provides enhanced resolution for grayscale images and lets you share a printer on a LocalTalk network.

hints
Instructions built into a font that TrueType or a PostScript controller uses to optimize the appearance of each character at a given size and resolution.

interpreter
The portion of a PostScript printer's controller that deciphers the PostScript code being sent from the Mac.

PostScript
A programming language created by Adobe Systems for describing the appearance of pages. When you print a document to a PostScript printer, the Mac's LaserWriter driver creates a PostScript program that describes the document's appearance.

PostScript clone
A printer whose interpreter understands PostScript but was created by a firm other than Adobe.

primary colors
The three basic colors from which all colors can be created. With subtractive color (mixed pigments such as paint or ink), the three primary colors are cyan, yellow, and magenta. With additive color (mixed light), the primaries are red, green, and blue.

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print head
The component in an ink jet or dot-matrix printer that moves from left to right across the page, applying ink as it goes.

rasterizer
Also called a *scaler,* the software responsible for translating a font outline into a bitmap of the point size and resolution required.

resident font
A font built into a printer. Compare with *downloadable font.*

resolution
The number of dots per inch a printer (or other output device) can render. Laser and ink jet printers generally have resolutions of 300 to 600 dots-per-inch.

resolution enhancement
Techniques that involve finessing a print engine's laser beam in a way that smoothes character edges and, in some printers, improves grayscale output.

rosettes
Small patterns of C, M, Y, and K dots that form a color halftone.

self-centering manual-feed slot
A print engine convenience feature that makes it easy to manually feed envelopes. Such a slot uses two adjustable guides; move one, and the other moves accordingly.

subtractive color
The process of creating colors by absorbing, or subtracting, light reflected from paper. With subtractive color, the three primary colors are cyan, yellow, and magenta.

toner
A fine plastic powder that laser printer engines melt onto paper to produce output.

toner scatter
An undesirable artifact produced by some laser printers that causes small type to appear heavy and overexposed, with hollow portions of characters such as *e* and *b* partially filled in. Toner scatter occurs because of stray electrical charges generated by a relatively imprecise corona wire, the component that attracts toner from the photoconductive drum to the paper.

virtual memory
Abbreviated *VM,* general work space in a PostScript printer that also holds downloadable fonts. Not to be confused with System 7's virtual memory feature.

CHAPTER THIRTY-THREE

Networking Basics

IN THIS CHAPTER

- Following the roadmap to a fully networked office
- Assessing the options and benefits of networking
- Comparing System 7 file sharing and AppleShare
- Phoning home with AppleTalk Remote Access

If you use two or more Macs, chances are you can benefit from connecting them to each other to form a network. Wait! Don't turn the page. It's true that networking has its technicalities — bandwidths and bridges, twisted pairs and topologies — but even if you are new to the Macintosh, you can set up a small network without immersing yourself in them. Small-scale Mac networking can be surprisingly easy and economical.

What's to gain? For one thing, your Macs can share an expensive add-on such as a laser printer or hard drive (see the Background box "Hardware You Can Share"). It's easier to buy a big-ticket item when you know that all your Macs will be able to share it.

The Wide World of Networking

Beyond sharing hardware, you can share information and ideas. Using *file server* software, you can store in one place files everyone needs to access — client databases, product fact sheets, downloadable laser printer fonts, or boilerplate templates for frequently produced documents. Using *electronic mail* software, you can send messages and files to co-workers. And with *multiuser* database software, everyone can access the same database file at once, eliminating the need to store a separate copy on each person's machine — and fretting over whose version is the latest.

ON THE CD

- Trawl, a network-management utility (in the Best of BMUG collection)

BACKGROUNDER

Hardware You Can Share

Sharing hardware doesn't mean just hard drives and laser printers. Here's a sampling of the other types of hardware you can share on a LocalTalk network.

- ❖ *ImageWriters* Using Apple's ImageWriter II/LQ LocalTalk Option board, you can share an ImageWriter II.
- ❖ *Telephone modems* Modems such as Shiva's NetModem series can be shared on a network. A network modem can't serve an office full of communications junkies, but it is ideal for several people who just check their e-mail now and then.
- ❖ *Fax modems* Cypress Research Corporation's FaxPro II system lets you set aside a modem-equipped Macintosh for your network's faxing needs. With a fax server, the Macs on your network are free from the grunt work of receiving faxes and converting documents for faxing.

  FaxPro II also lets you create a database of documents that you fax frequently — brochures, price lists, technical notes, and so on. A document in a fax database has already been converted into faxable form; when you need to fax it, the server simply dials and faxes the converted document.
- ❖ *Serial devices* With Shiva's NetSerial, you can put virtually any serial device — modem, pen plotter, daisy wheel printer — on a network.
- ❖ *Alternate storage devices* You can share tape backup drives, erasable optical drives, and removable-media drives such as Bernoulli and SyQuest drives. You can even share CD-ROMs via an AppleShare server, provided the server's hard disk has enough free space to keep track of the CD-ROM's vast number of files.

Many people are intimidated by networking not only because of the jargon that surrounds it, but also because it provides so many sharing options. The best way to conquer both fears is to start small and add new capabilities as you need them — and as you master those you already have.

In this chapter, I present a roadmap you may want to follow in your journey to a networked office. Along the way, I examine networking's benefits and look at some products. For a detailed look at the wide world of Macintosh networking, see *Macworld Networking Handbook* (IDG Books, 1992).

Phase 1 — Sharing a Printer

At its simplest level, Macintosh networking means sharing a PostScript-based printer such as Apple's LaserWriter Pro 600 or 630 or any of the other numerous Mac-compatible PostScript printers that are available. Like a co-op vacation home, a PostScript printer is a less painful purchase when a large group can enjoy it. As I described in the previous chapter, many non-PostScript laser printers, such as Apple's LaserWriter Select 300 and StyleWriter II and GCC's PLP II machines, can also be shared on a network.

Sharing a PostScript printer is particularly easy because all you need are cables that interconnect the Macs and the printer. You don't need any special networking software; Apple's LaserWriter printer driver, included with the Mac's system software, contains all the smarts needed to communicate with any Mac-compatible PostScript printer. Similarly, all PostScript printers contain built-in software that enables them to listen for numerous machines and handle print jobs on a first-come-first-served basis. In short, the Macintosh and the printer already know how to talk with each other: Your job is to add the lines of communication.

Lines of communication

Those lines can take a few forms. If you want the Apple brand name, endow each Mac and printer with a LocalTalk Connector Kit, which includes a 6-foot length of LocalTalk cable and a small connector box that plugs into a Mac's rear-panel printer connector or into the printer itself. The connector box's nine parts electrically isolate the network's components, helping to prevent wholesale equipment carnage should one item short out.

The cable itself isn't too different from what you'd find in a stereo system. It contains a pair of wires twisted around each other, surrounded by a braided wire shield that keeps electrical interference out and helps prevent the signals in the cable from interfering with nearby radios or TVs. Included with the connector kit is a small connector called a *cable extender*, used for attaching two cables to each other. If you need longer cable lengths — perhaps to reach a Mac in another room — Apple offers 30- and 75-foot LocalTalk cables.

Apple's cabling is usually discounted below its retail prices, but you can save even more by using one of the LocalTalk cabling alternatives, such as Farallon Computing's popular PhoneNet cabling system. PhoneNet connector boxes often sell for half the price of Apple's. Another plus: PhoneNet uses ordinary telephone wiring rather than the special cabling LocalTalk requires. PhoneNet can even use the telephone wiring already present in a building. That can save you a fortune in cable costs, especially if your Macs are far apart. Adapters are also available that let you mix LocalTalk and telephone cabling on the same network — helpful if you're already using one kind of cabling and decide to add more machines to your network.

Watch your wires

Whether you use LocalTalk or a LocalTalk-compatible cabling scheme, you'll hook up your Macs and printers as shown in Chapter 29 (Figure 29-4 "A Network Diagram"). Be sure each cable is snugly attached to its connector, and tuck the cables safely behind desks so people won't trip over them or jerk them loose with desk chairs. And avoid the common pitfall of leaving a cable dangling, without going into a connector. The end points of a LocalTalk network are connectors to which only one cable is attached. In this case, the network isn't properly terminated — its end point isn't defined, and it won't work properly.

Installing printing software

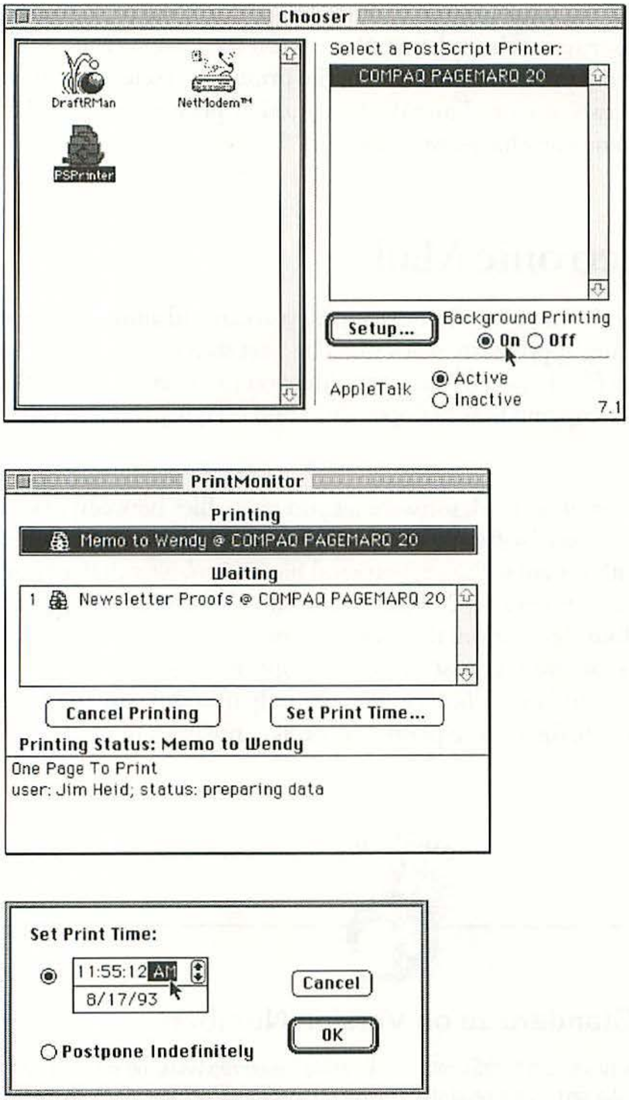
After you unite the machines, you need to configure each Macintosh for network printing. First, be sure the laser printer is warmed up (wait until it prints its start-up page). Next, use each Mac's Chooser (in the Apple menu) to turn on AppleTalk and select the LaserWriter printer driver icon. (If you don't see this icon, you need to install the printer driver from the Mac's system disks or from the disks that accompany the printer.)

Next, specify a user name for your machine using the Sharing Setup control panel. Use the name of the person who uses that Mac, or a name that describes the Mac's purpose, such as Publishing Station. This name enables the LaserWriter driver to provide useful feedback when you're printing — more about that shortly.

Finally, activate the Background Printing option so you're not forced to wait while the Mac and printer communicate during each print job. Background printing intercepts data en route to the printer, saves it on disk in a spool file, and then quickly returns control of the Mac to you so you can get back to work. Then, a system program called PrintMonitor transmits the spool file to the printer in short bursts while you work (see Figure 33-1 "Monitor Your Printing").

Testing your setup

After you perform these steps, close the Chooser and try printing a short document. If you've activated background printing, you won't see any status messages (telling you who's printing what on which printer) unless you open the PrintMonitor window by choosing its name from the Application menu. If background printing is off or if PrintMonitor's window is open, you'll see status messages such as "processing job." If your test document doesn't print, retrace your steps and double-check the cables. If it does print, perform these steps on each Mac in the network.



Select a PostScript Printer:
COMPAQ PAGEMARQ 20

Background Printing ◉ On ○ Off

AppleTalk ◉ Active ○ Inactive

7.1

Printing
Memo to Wendy @ COMPAQ PAGEMARQ 20

Waiting
1 Newsletter Proofs @ COMPAQ PAGEMARQ 20

Printing Status: Memo to Wendy
One Page To Print
user: Jim Heid; status: preparing data

Set Print Time:
◉ 11:55:12 AM
8/17/93
○ Postpone Indefinitely

Figure 33-1: Monitor Your Printing When you're using System 7 (or System 6 MultiFinder), selecting the Background Printing option in the Chooser (top) eliminates having to wait for the printer. The PrintMonitor window (middle) displays the document names of jobs waiting to be printed. Status messages appear at the bottom of PrintMonitor's window (or at the top of the Mac's screen when background printing is disabled). By clicking on the Set Print Time button, you can delay printing until a specific time, or postpone it indefinitely using the pop-up dialog box (bottom).

If you always use the same printer, you need to perform the previous chores only once; the Chooser remembers that you've chosen the LaserWriter driver as well as the user name you typed and the name of the printer you selected. However, if you switch between two or more LaserWriters or other printers, you need to use the Chooser each time you change printers.

Phase 2 — Electronic Mail

After you string the lines between machines, you can add additional capabilities to a network by adding appropriate software. The next step may be to add software that lets you transfer files between Macs, enabling you to say good-bye to the so-called "sneaker net" — copying files to floppy disks and carrying them to other machines in your office.

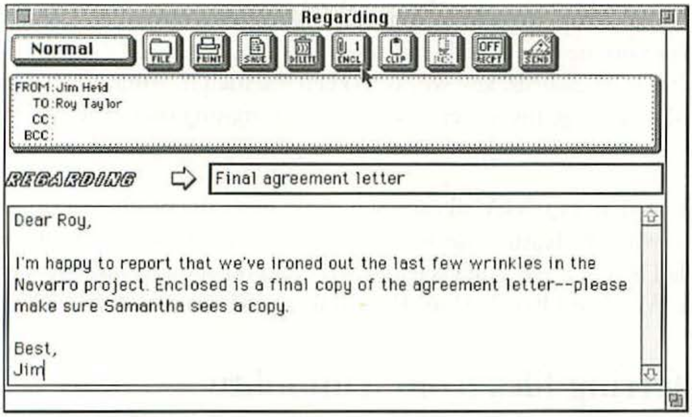
Several categories of network software let you move files between machines. One is *electronic mail*, or *e-mail* software such as Microsoft Mail or CE Software's QuickMail. With e-mail software, you send files as *enclosures* that accompany messages you type (see Figure 33-2 "Files Enclosed"). When messages arrive at their electronic mailbox destination, the recipients can save the enclosed files on their own disks. You can even request a return receipt message, which notifies you when a message is read. In large offices, e-mail not only makes it easy to transfer files, it also helps eliminate distracting phone calls and annoying games of phone tag.

QUICK TIPS

Standardize on Version Numbers

If you're setting up a network to share a PostScript printer, be sure all Macs use the same version of the LaserWriter driver. If you mix System 6 and System 7 LaserWriter drivers on the same network, you're likely to become a casualty of what's often described as "LaserPrep wars" — a conflict between the two drivers. The result of the conflict is an error message saying that you need to restart the printer — and a lot of waiting.

To avoid LaserPrep wars, be sure to use the same version of the LaserWriter driver on each Mac in your network. In fact, it's a good idea to standardize on the same system and application software versions, too. Networks are more reliable and easier to troubleshoot when everyone is using the same software versions.



FROM: Jim Heid
TO: Roy Taylor
CC:
BCC:

Final agreement letter

Dear Roy,

I'm happy to report that we've ironed out the last few wrinkles in the Navarro project. Enclosed is a final copy of the agreement letter--please make sure Samantha sees a copy.

Best,
Jim

Figure 33-2: Files Enclosed With electronic-mail software such as CE Software's QuickMail, shown here, you can enclose disk files with messages. The recipient clicks on the ENCL button to retrieve the file from the mail server.

E-mail details

Each brand of e-mail software has its own operating style, but all require similar setup steps. First, you designate one Mac as the *e-mail server*, the electronic post office that stores messages and forwards them to their addressees. You can still use the server Mac to run other programs, but you'll notice it slows down when people are sending and retrieving mail as it divides its time between postal duties and running other programs.

For this reason, it's important to carefully consider which Mac in a network is best suited to being a server. You should use a machine with several megabytes of free hard disk space and at least 4MB of memory. If you anticipate heavy mail volume, consider using a faster Mac — a Classic II instead of a Classic, for example. And make sure you use a machine that's reliable: If someone in your office likes to run prerelease versions of software (which may contain bugs) or games (which often monopolize the Mac's hardware), that person's Mac is not an ideal server.

Setting up the e-mail server

After you choose a server, you set up the e-mail server software, which usually comprises a system extension that loads the server software into the Mac's memory during start-up and an *administrator* program that you use to create a mailbox for each person in the network. Finally, install on each Mac the e-mail *client* software, which generally includes a desk accessory that lets the user read and send mail and a start-up document that lets the Mac notify the user when a message arrives.

After the initial setup, the administrator's job becomes custodial. Using the administrator program, he or she adds and removes users as needed, helps users who have forgotten their passwords, and works to keep the mail moving. Each user can — and should — change his or her password when signing on to the system for the first time.

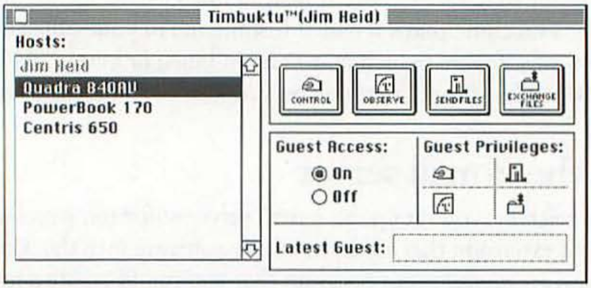
Microsoft Mail and QuickMail can each easily meet the needs of a small network. QuickMail wins the features derby, but it's harder to learn. An advantage to Microsoft Mail is that it lets you exchange mail and documents directly within Microsoft Word and Excel, Aldus PageMaker, and several other applications.

Transferring files from Timbuktu

For a variation on the file-transfer theme, you may want to investigate Farallon Computing's Timbuktu (see Figure 33-3 "I'm in Control"). Timbuktu can transfer files, but it isn't an e-mail package; instead it lets you control one Macintosh from another — for example, to help someone who's struggling to master a difficult program.

You can also take over all the screens in the office — great for group training sessions. And you can use one Mac's modem or ImageWriter printer from another Mac. With Farallon's Timbuktu/Remote, you can even control a Mac over the telephone lines, although you need a 9600-bps or faster modem for tolerable performance.

Timbuktu is also available for DOS PCs running Microsoft Windows. With the Windows and Mac versions of Timbuktu, you can not only transfer files between the two platforms, but control one from the other.



Guest Access: ● On ○ Off

Figure 33-3: I'm in Control Farallon Computing's Timbuktu software lets you transfer files between Macs and control one Mac from another. Timbuktu's desk accessory, shown here, also lets you specify passwords to protect against unauthorized access to your files or your Mac.

Phase 3 — Creating a File Server

E-mail products can eliminate sneaker wear but not worries over whose version of a certain document is the most current. If anything, swapping files between different machines only fuels those fears. And having important files scattered across the hard drives and floppy disks in an office makes backing up difficult.

The solution? Use file-server software to make one or more hard drives available to the entire network. A file server is an electronic version of the office filing cabinet, providing shared storage for files that everyone needs (or that only certain people need: You can create private folders that can't be used without a password). Backing up is simplified, because all the important documents are stored in one place. And the entire office can take advantage of that high-capacity hard drive you just bought.

Or so go the claims. In reality, a network's hard drive isn't nearly as fast as a *local* one (attached directly to your Mac) because LocalTalk transfers data more slowly than the Mac's SCSI port does. For example, Microsoft Excel takes about 10 seconds to start from my local hard drive but over 30 seconds to start from my file server. What's more, putting all that extra data on a network's cabling slows down everything else that takes place on the network, such as printing and exchanging e-mail. Thus, it's best to use a file server to store only documents, not programs.

Networking in the fast lane

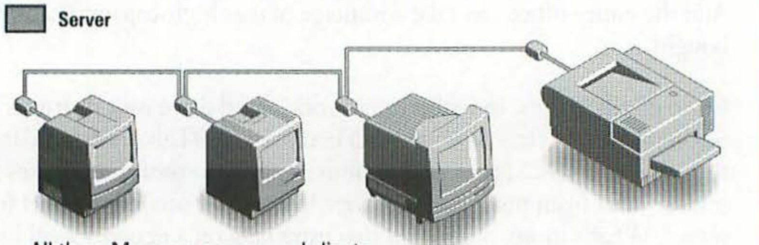
It's worth noting that faster network cabling systems are available. In the Mac world, the best known is *Ethernet,* which is built into a growing number of Mac models and laser printers. Ethernet adapters are also available for existing Macs, including PowerBooks. If you frequently transfer large files over your network — scanned images, sounds, QuickTime movies — Ethernet will deliver far more satisfying performance than will LocalTalk. Best of all, you can mix and match LocalTalk and Ethernet on the same network. You may set up some Ethernet highways for your publishing or scanning workstations, and use LocalTalk for the rest of the machines.

Distributed and dedicated servers

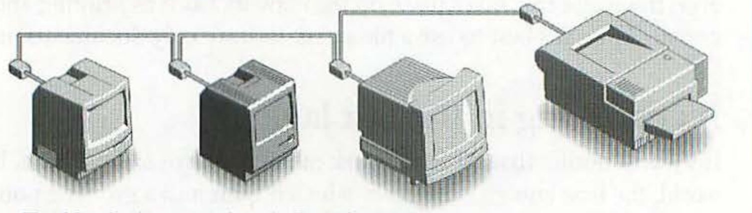
File servers come in two flavors: *distributed* and *dedicated* (see Figure 33-4 "Server Approaches Compared"). With distributed serving, anyone in the network can turn his or her machine into a file server by making one or more folders — or the entire contents of a hard drive — available to others. Once that's done, anyone on the network can *mount* it and use it as though it were a local drive.

SERVER APPROACHES COMPARED

With distributed file serving (top), you can make any Mac in the network act as a server by sharing one or more folders or the entire contents of a hard drive. A server can still be used to run application programs, but its performance slows when other users access its hard drive. With dedicated file serving (bottom), a Mac is set aside to act as a server. A dedicated server can't be used to run programs, but it could run electronic-mail server software.



All three Macs are servers and clients



The Mac in the center is a dedicated server

Figure 33-4: Server Approaches Compared

Apple's System 7 provides distributed file-serving features; for details on using them, see Chapter 23. The distributed approach is often called *peer-to-peer* file serving, because each machine on the network is considered an equal as far as file serving is concerned.

With the dedicated approach, you set aside, or *dedicate*, one Mac and its hard drive to act as a server for everyone. A dedicated file server generally isn't used to run applications, although you might also use one to act as an e-mail server.

Apple's AppleShare software, which supports up to 150 users, is the only dedicated server software available that uses a Mac as the server. A high-performance version of AppleShare, AppleShare Pro, runs on Apple's Workgroup Server 95, which is essentially a Quadra 950 that Apple has souped up with a high-speed SCSI card and AU/X software.

Clearly, distributed file serving is the more economical approach. System 7 requires no extra hardware beyond cabling. But one downside to distributed file serving is that someone can turn off the file sharing drive at any time, with disastrous results for anyone using it. System 7 provides some safeguards for this, but it still can happen. And of course, a Mac acting as a file server slows down when others are accessing its hard drive.

If you use a member of the LC, II, Centris, or Quadra families as a dedicated server, you can cut the cost of your server by several hundred dollars or more by not buying a monitor or keyboard for that Mac. Such a server is often called a *headless* server.

To set up a headless server, use the monitor and keyboard from a different Mac in your office. Place the AppleShare File Server icon (or an alias of it) in the Startup Items Folder. Then shut down the server Mac, disconnect the monitor and keyboard, and then start the server up again.

AppleShare 3.0 and later versions let you run the AppleShare Admin program from another Mac on your network, so if you need to perform minor maintenance on the server, you don't have to reinstall the video hardware and keyboard. You will need to reinstall the video hardware and keyboard, however, if you want to run the Admin program on the server itself or if you want to run applications on the server.

Combining AppleShare and System 7 file sharing

Can AppleShare and System 7 file sharing coexist on the same network? Yes, but only to a degree. The server Mac can access shared folders or drives that other Macs have made available through System 7's Sharing command.

However, you can't start System 7 file sharing on the server Mac — the File Sharing area of its Sharing Setup control panel is missing. The only way to share folders on the server Mac is through AppleShare.

Focus on AppleShare

This section describes how to set aside a Mac to be a file server, and how you might use AppleShare's additional security options to control access to the server's contents.

Three steps to server setup

Installing AppleShare requires three basic steps:

1. Install the server software on one Macintosh.
2. Install the workstation software on each of the other Macs in your network.
3. Configure the server by supplying user and group names, specifying access privileges, and performing other administrative tasks.

In the world of AppleShare, the person in charge of setting up and maintaining the server is the *administrator.* The administrator uses a program called AppleShare Admin to perform the previous steps.

Installing AppleShare

To install the AppleShare server or workstation software, you use Apple's Installer utility. The server disk's installer script copies to the Mac's hard disk the AppleShare Admin program, the AppleShare File Server program (which actually starts the server), and an extension named File Server Extension. After installing this software, restart the server Mac to load the extension.

After you've installed the server software and restarted the server Mac, you're ready to create users and groups. With AppleShare, you do this using the AppleShare Admin program. If you had previously set up users and groups on the server Mac using System 7's file sharing features, AppleShare Admin offers to convert the users and groups into its own format.

QUICK TIPS

Backing Up Your Users & Groups Data File

AppleShare's Admin utility creates a file called Users & Groups Data File that stores the user and group names you've created. When you alter your user and group settings, make a backup copy of the Users & Groups Data File. If you switch hard drives or if something happens to your old file server, you can copy the backup file to your new server and not have to re-create all your user and group names.

To back up the Users & Groups Data File, open the server's System Folder and then open the Preferences folder. Drag the Users & Groups Data File to a floppy disk. Keep your backup in a safe place — preferably in the same safe place you use to store your server backups.

This convenience feature means you can start out with System 7's file sharing features, and then progress to AppleShare without losing users and groups and their access privilege settings. (If you've used the server Mac's hard drive extensively, your server will provide better performance if you defragment its hard drive. See Chapter 27 for details on defragmenting utilities.)

If you're unfamiliar with the concepts and steps behind creating users and groups, you may want to review the section "Access has its privileges" in Chapter 23.

Specifying security options

AppleShare provides password and other security features that help ensure the privacy of each user's data on the server. During the setup phase, you may want to use the File Server Preferences dialog box to take advantage of the security options AppleShare provides. With the File Server Preferences dialog box in AppleShare's Admin program, you can specify that passwords expire after a certain amount of time, and more.

While you're putting things under lock and key, you may want to also specify access information for individual programs and documents. You can use the Access Information command to specify that documents and programs be copy-protected so that users can't copy them from the server to their machines. You can specify that only certain folders — not the entire hard disk — be available to others on the network. You can also specify the maximum number of users that can access a given program or document.

Table 33-1 lists some typical access privilege settings. Table 33-2 shows which privileges you need in order to perform various tasks.

Preparing to serve

After you've set up your server and created or updated your user and group lists, you're ready to put the server into action. To do so, run the AppleShare File Server program. After a few moments, the AppleShare server windows appear, indicating that the server is up and running.

Application Software Considerations

Because file server software turns a hard disk into a shared storage area, it's possible that more than one person could try to modify the same document at the same time. One part of a file server's job involves keeping track of who's opened what. It does so through *file-access protocols* — rules built into the file-serving software that specify how users can access files. A *file locking* protocol locks a file against alteration after one person has opened it.

Table 33-1
Access Privilege Reference

		Set Privileges Like This...		
If You Want to...		***See Folders***	***See Files***	***Make Changes***
Give everyone on the network all access privileges	Owner	•	•	•
	User/Group	•	•	•
	Everyone	•	•	•
Share a folder with one person or group	Owner	•	•	•
	User/Group	•	•	•
	Everyone			
Keep a folder private so that only you can access it from other machines	Owner	•	•	•
	User/Group			
	Everyone			
Keep a folder private but allow others to drop files or folders into it	Owner	•	•	•
	User/Group			•
	Everyone			•

Table 33-2
Access Privilege Sampler

	Set Privileges Like This...		
If You Want to...	***See Folders***	***See Files***	***Make Changes***
Copy a file to a folder			•
Copy a file from a folder	•	•	
Copy a folder to a folder	•		•
Copy a folder from a folder	•		
Create a file	•	•	•
Create a folder	•		•
Delete a file		•	•
Move a folder to a folder	•		•
Move a folder from a folder	•		•
Open a file		•	
Save changes to a file		•	•

The multiuser difference

But some tasks, especially database management and accounting, benefit from users being able to simultaneously modify a file. Your file server can accommodate such tasks if you use *multiuser* software — programs that allow multiple users to access and modify the same documents. With a multiuser database manager such as Claris FileMaker Pro, for example, a secretary can enter new client records, a sales representative can print a sales report, and a shipping clerk can update inventory figures — at the same time, from the same database.

A multiuser program handles these simultaneous requests without file clobbering through a *record-locking* protocol, which enables multiple users to access a file, but only one person to modify a given record. Apple's AppleTalk Filing Protocol (AFP) is a set of file-sharing rules that developers of network-compatible applications follow.

Some real-world examples

How do some of the leading software packages handle file and record locking? Here are some examples.

- Microsoft Works lets numerous users open the same file, but only the one who opened it first can modify it. Anyone else must use the Save As command to give it a new name. Microsoft Excel works similarly.
- Aldus PageMaker lets numerous users open a template or a copy of a publication, but only one person at a time can open an original publication.
- Microsoft Word lets you open a document that is in use by someone else, but you can't save any changes unless you save the document under a different name, on a different drive, or in a different folder. If you open a document that someone else has gotten to first, Word displays a message letting you know that the file is in use.
- Claris MacDraw II and MacDraw Pro both let multiple users open a file, but only the person who opens it first can save changes normally (that is, by using the Save command). If others try to save changes they've made, a message asks if they want to save the changed document under a new name, replace the original, or not save the changes after all.
- Claris FileMaker Pro, ACI's 4th Dimension, and Microsoft's FoxBase+/Mac are multiuser database managers that let numerous users work simultaneously with a database file. However, only one person at a time can modify a given record (one entry in the database, such as someone's name and address). Multiuser data managers also provide security features that let you make certain information available to only certain people. In a personnel database, for example, you might want to give everyone access to employee names and phone extensions, but only certain managers access to salary information.

QUICK TIPS

Special Steps for Sharing Removable Media

Both AppleShare and System 7's file sharing software enable you to make removable media such as SyQuest and Bernoulli cartridges and CD-ROMs available to the Macs on your network. If you use AppleShare, use the AppleShare Admin program to mount and unmount cartridges or CD-ROMs and to make them available to the network.

With System 7's file sharing software, sharing removable media isn't as straightforward. You need to insert the cartridge or CD-ROM *before* using the Sharing Setup control panel to turn file sharing on. If you turn file sharing on, insert a cartridge or CD-ROM, and then choose Sharing, a dialog box appears stating that "not all volumes are available for file sharing." If you see this somewhat arcane message, turn off file sharing, insert the cartridge, and *then* turn file sharing on.

A similar problem can surface if you try to eject a cartridge after sharing it. If you drag the cartridge's icon to the Trash or select the icon and choose Put Away, an error message appears saying that the disk "could not be put away because it is being shared." This message appears even if you never used the Sharing command to make that cartridge available. The solution: Turn off file sharing.

To avoid both of these hassles, remember this rule: If you want to share a cartridge, insert the cartridge before turning file sharing on. To eject that cartridge, first turn file sharing off. Or use a free utility called UnMount It, by Jim Luther — it lets you eject removable media without having to turn off file sharing.

As you can see, not all programs behave in the same way on a network. After setting up a network for file serving, test your applications to see how they behave when more than one person tries to open a document.

Remote Control with AppleTalk Remote Access

If you have employees who travel frequently or work at home, you may want to give your network *remote access* features to allow those users to dial in and access the file server, e-mail system, and even laser printer.

Apple's AppleTalk Remote Access is a software package that lets a remote Macintosh connect to another Macintosh that's also running AppleTalk Remote Access. To use AppleTalk Remote Access, you need two modems — one connected to the office-based Macintosh and one connected to the remote Macintosh.

Required equipment

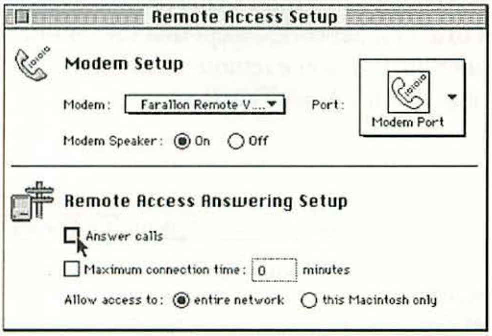
AppleTalk Remote Access works with 2400-baud modems, but 9600-bps or faster modems provide much better performance. With a 2400-bps modem, data gets transmitted far slower than on a network, and remote network access can seem slower than the pony express. With a 9600-bps or faster modem, however, performance is quite acceptable — not as fast as a local network node, but fast enough for electronic mail to still seem electronic.

You can use one copy of the AppleTalk Remote Access software on up to three Macs. If you need remote access on more than three Macs, you must buy additional copies of AppleTalk Remote Access.

Setting up for incoming calls

After installing the AppleTalk Remote Access software on one of your office-based Macs, use the Remote Access Setup control panel to configure it to accept calls (see Figure 33-5 "Now Taking Calls").

With AppleTalk Remote Access, you can use the standard System 7 Users & Groups control panel to create lists of users and groups who are eligible to access the network from a remote location. For added security, you can specify a *call-back number* for each user (see Figure 33-6 "I'll Get Right Back to You").



Remote Access Setup

Modem Setup

Modem: Faralion Remote V....

Port: Modem Port

Modem Speaker: ● On ○ Off

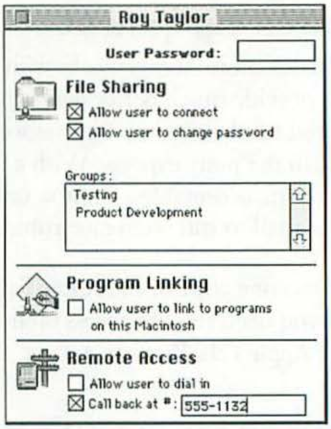
Remote Access Answering Setup

☐ Answer calls

☐ Maximum connection time: 0 minutes

Allow access to: ● entire network ○ this Macintosh only

Figure 33-5: Now Taking Calls To set up AppleTalk Remote Access, open the Remote Access Setup control panel and check its Answer Calls box. You can also specify whether you want to grant remote access to only the Mac that's running AppleTalk Remote Access, or to the entire network that Mac is attached to. The second option provides more security by preventing access to other machines on your network.



Roy Taylor

User Password:

File Sharing

☒ Allow user to connect

☒ Allow user to change password

Groups:

Testing
Product Development

Program Linking

☐ Allow user to link to programs on this Macintosh

Remote Access

☐ Allow user to dial in

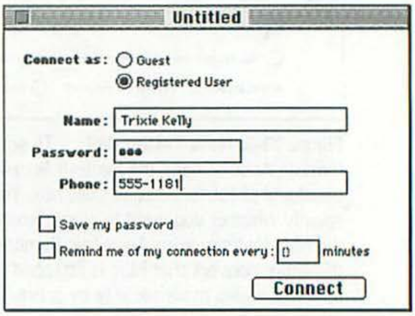
☒ Call back at #: 555-1132

Figure 33-6: I'll Get Right Back to You With AppleTalk Remote Access, when a user for whom you've specified a call-back number dials in, your modem temporarily disconnects the user and then immediately dials the call-back number to reestablish the connection.

Mac, phone home

To connect from a remote Macintosh, use the Remote Access control panel on the remote Mac to select the modem you're using. Then start the Remote Access program that came with AppleTalk Remote Access. A new, untitled *connection document* appears (see Figure 33-7 "A New Remote Connection"). To make the connection, click Connect.

With a connection established, you can use the Mac's Chooser desk accessory to select remote printers, file servers, and electronic mail systems. Everything works as though you're connected to a local network, except that the remote network appears to respond in slow motion. (For some remote access survival tips, see the Quick Tips box "Time-Saving Tips for AppleTalk Remote Access").



Untitled

Connect as: ○ Guest ● Registered User

Name: Trixie Kelly

Password: •••

Phone: 555-1181

☐ Save my password

☐ Remind me of my connection every: 0 minutes

Figure 33-7: A New Remote Connection Creating a new connection document in AppleTalk Remote Access. Select the Guest or Registered User option as appropriate. If you're connecting as a registered user, type your user name and password in the appropriate text boxes, and then type the phone number for the home base's modem. When the two modems are on speaking terms, a status window appears.

CE Software's QuickMail takes an especially versatile approach to remote access by being able to talk to any computer with a modem. If you dial into a QuickMail server using a computer other than a Mac, QuickMail discards the Mac interface and presents special text menus for accessing the system. Combine that capability with a low-end laptop computer, and you have an inexpensive way to keep in touch.

Don't quit America Online yet

Remote-node setups allow network e-mail systems to span the miles, but commercial e-mail and on-line services such as CompuServe and America Online still have their place. For starters, their multiline phone networks can accommodate thou-

Time-Saving Tips for AppleTalk Remote Access

A remote access session can seem like a dream in which you're trying to run with legs made of lead. You can prevent the dream from turning into a nightmare by following the tips in this box.

- If you're accessing a remote file server, don't leave its directory windows open on your screen. The Finder updates directory windows now and then, and the updates take more time when you're connected via modem. Close a remote volume's directory window as soon as you're done with it. As soon as you're done with a remote volume, drag its icon to the Trash. Note that this does not disconnect you from the remote Macintosh.
- Don't run an application program stored on a remote file server. If you try, AppleTalk Remote Access displays a warning saying that the program will "take a long time to be opened." Believe it — and then click Cancel.
- Think twice about printing a document containing downloadable fonts or bitmapped graphics such as scanned images. You'll get the fastest remote printing times if you stick with fonts that are built into the remote network's printer.
- Use the connection-reminder option in the remote access connection document window (it's labeled *Remind me of my connection*). When you choose this option, a notice appears at specified intervals reminding you that you're connected to a remote machine — and paying phone charges all the while.
- You can use the call-back option to reverse the phone charges on lengthy remote access sessions. You'll need to make a brief call to establish initial contact, but then the remote system will call you back, and thus become responsible for phone charges.
- If you plan to transmit electronic mail to the remote system, prepare your outgoing messages before connecting. If you'll be copying files to a remote server, compress them first using a utility such as Aladdin Systems' StuffIt. Compressed files take less time to transfer over the phone lines.

sands of callers at once. With remote-node access, only one person at a time can call in to check his or her mail. If you exchange e-mail via telecommunications services such as MCI Mail or CompuServe, you'll be glad to know that QuickMail and Microsoft Mail provide gateway features that unite a network and a service by automatically dialing the service at specified intervals and sending or retrieving mail to or from the service.

Other remote access products

Another way to establish remote access connections is by equipping one of your office-based Macs with a Shiva NetModem. The NetModem includes software that lets you dial into the network from a remote Macintosh. Shiva also sells a DOS program called DOS Dial-In that lets DOS machines dial in to a LocalTalk network. DOS Dial-In could be of special interest to people who use DOS portable computers and want to exchange documents and e-mail with remote networks.

Other Networking Options

After you master printer sharing, electronic mail, and file serving, you may want to investigate more advanced networking options. If you use DOS PCs, you can tie them into the network using LocalTalk expansion boards such as Apple's AppleTalk Connection for DOS and Windows, which includes software that lets LocalTalk-equipped PCs access an AppleShare server. You can also turn a PC into a server for Macs using software such as Novell's NetWare. Microsoft Mail and QuickMail are available for PCs.

Then there's *groupware*, a genre of network-oriented software designed around the fact that people usually collaborate on projects. Mainstay's MarkUp lets multiple users electronically annotate a document and keeps track of when comments were made. CE Software's In/Out lets you track the whereabouts of the employees in your office.

At the high end, you'll find products that enable the Mac to tap into minicomputer- and mainframe-based networks such as those from IBM and Digital Equipment Corporation (DEC). Macs are especially popular among users of DEC's VAX minicomputers: It's been estimated that over half of all VAX installations also use Macs.

Conquer the Basics First

But before venturing into these waters, master the basics. Add one capability at a time to your network, and be sure everyone understands it before expanding further. And don't ignore your network-administration duties: Develop a filing system for your server. (For some additional tips on managing your network, see the Quick Tips box "Network Etiquette.") Be on the alert for viruses — as I explained in Chapter 27, networks enable them to spread easily.

Follow these basic guidelines, and you'll have fewer technical problems and questions to answer. In short, you'll increase your net's worth.

QUICK TIPS

Network Etiquette

Following these basic rules can help make communal computing work smoothly.

- *Run applications locally* Avoid running large applications from a server. They'll perform slowly and bog down the network. Small, fast-loading applications work well from a remote server, but a complex program like PageMaker can make a network snail slow. Run large applications locally, ideally from a hard disk; use the server primarily for sharing and storing documents.
- *Don't run unreliable software* Never run prerelease software or untested shareware on a network. A crash for one can mean a crash for all.
- *Don't delete indiscriminately* Don't throw away a file with a cryptic name; it may be a work file that another user's application has created. Check with others before deleting files you don't recognize.
- *Release volumes you don't need* When you're done with a server volume, release it by dragging the volume's icon to the Trash at the Finder or by selecting the icon and choosing Put Away from the Finder's File menu.
- *Don't break connections* If you must unplug a LocalTalk connector, make sure all users have saved their work. Reliable network software can usually reestablish a connection, but don't count on that. If you must detach from the network, disconnect your machine by unplugging its network box from your Macintosh, not by unplugging the cables that go into the network box.
- *Share applications carefully* Many programs weren't written with network use in mind, and can crash when used by more than one person at the same time. Be sure a program is designed for network use before storing it on a shared hard disk. And don't ignore the legal ramifications of networking. You may be required to buy a special license or purchase multiple copies of a program to use it on a network.
- *Back up religiously* The crash of one person's hard disk leads to depression; the crash of a shared hard disk can lead to a riot.

CHAPTER 33 CONCEPTS AND TERMS

- Networking enables Macs and LocalTalk-equipped DOS PCs to share expensive hardware such as laser printers. You can also use electronic mail and file-server software to share ideas and information with coworkers.
- Sharing a PostScript printer is relatively easy: Apple's LaserWriter driver (and Adobe's PSPrinter driver) can communicate with any Mac-compatible PostScript printer. All you add are cables.
- Electronic mail software lets you transfer files between Macs as enclosures that accompany messages you type.
- File server software lets you turn one or more hard disks into a central storage area that can hold documents or applications. Security features enable you to assign passwords to folders containing sensitive data.
- File server software provides file-locking protocols that prevent multiple users from trying to modify the same file. Record-locking protocols enable multiuser database managers to allow many users to access a file, but only one user at a time to modify a given record.
- Dial-in access features enable you to tap into your network using a telephone modem. For acceptable performance, however, you need a 9600-bps or faster modem.
- To get reliable results from your network, start small and add new services one at a time, testing often.

administrator
The person in charge of setting up and maintaining a network. Often seen pulling his or her hair out or weeping quietly.

AppleTalk Filing Protocol
Abbreviated *AFP,* a set of file-sharing rules that developers of network-compatible applications follow.

cable extender
A small adapter, included with a LocalTalk connector kit, used for attaching two cables to each other.

call-back number
In AppleTalk Remote Access, a number you specify that helps ensure security by disconnecting and then calling back anyone who dials in.

client
Anyone who is on the receiving end of network services such as a file server. Also the person who often makes life miserable for the administrator.

dedicated file serving
A disk-sharing approach in which one Mac and its hard drive is set aside to act as a server for everyone. A dedicated file server generally isn't used to run applications, although you may also use one to act as an e-mail server.

distributed file serving
A disk-sharing technique in which anyone on the network turns his or her machine into a file server by making one or more folders — or the entire contents of a hard drive — available to others. Apple's System 7 provides distributed file-serving features. The distributed approach is often called *peer-to-peer* file serving, because each machine on the network is considered an equal as far as file serving is concerned.

electronic mail software
Programs that let you send messages and files to co-workers on a network. Examples include CE Software's QuickMail and Microsoft Mail.

enclosure
In electronic mail, a file that usually accompanies a message you send. When a message arrives at its destination, the recipient can save the enclosed file on his or her own disks.

Ethernet
A high-speed networking system that's built into a growing number of Mac models and laser printers. Ethernet adapters are also available for existing Macs, including PowerBooks.

file server
A computer whose hard drive (or a portion thereof) has been made available to other users on a network.

file-access protocols
Rules built into the file-serving software that specify how users can access files. A *file locking* protocol locks a file against alteration after one person has opened it. A *record-locking* protocol enables multiple users to access a file but only one person to modify a given record.

headless server
A file server that lacks a monitor or keyboard.

local hard drive
A hard drive attached directly to your Mac — as opposed to a drive that you access over a network.

mount
To connect to a server so that its folders and icons appear on your Mac's desktop.

multiuser database
A database program that enables multiple network users to access the same database file at once, eliminating the need to store a separate copy on each person's machine.

CHAPTER THIRTY-FOUR

Input Devices

IN THIS CHAPTER

- Understanding how input devices work
- Shopping for alternatives to Apple's keyboard and mouse
- Talking to the Mac with PlainTalk speech recognition
- Surveying input devices for PowerBooks

The Mac's *input devices* — its keyboard and mouse — are your links to the Mac, letting you move around the screen in the direction of your choice. And like most people, you're probably content using Apple's stock input devices. After all, one mouse or keyboard is the same as another, right?

Actually, you can choose from a large and varied selection of alternative input devices. Some are keyboards and mice that may appeal to people who find Apple's input devices uncomfortable or too expensive. Others fall into the different-strokes-for-different-folks category: *Trackballs* don't require as much desktop space as mice, while *graphics tablets* offer pen-like control for drawing and drafting applications. And then there are the *voice-recognition* capabilities of Apple's AV Macs, which let you lighten the load on your hands and also make the Mac accessible to people with physical disabilities that prevent them from using a keyboard or mouse.

Although some alternative input devices are available for the Plus, most are designed for later machines. These newer machines are equipped with the *Apple Desktop Bus* (ADB), an expansion system designed for input devices (see the Background box "The Inbound Bus"). In this chapter, I describe the most popular input devices available for the Mac family and spotlight some products from each class.

Keyboard Considerations

In the Mac world, most alternative input devices are alternatives to the mouse. True, a *pointing device* is the cornerstone of the Mac's graphical interface, but the keyboard is essential too, especially for typing-intensive applications such as word processors, data managers, and spreadsheets.

BACKGROUNDER

The Inbound Bus

The Apple Desktop Bus (ADB), used on all Macs except the Plus and its predecessors, is a simple expansion system designed for input devices. The Mac provides two ADB connectors, as do many ADB input devices. You can attach multiple input devices to a single connector by *daisy-chaining* them — attaching one device to another. Although the ADB can accommodate up to 16 devices, Apple warns against attaching more than three to each connector because ADB signals deteriorate as the cable length increases.

The Mac's ADB connectors also provide a source of power, so you don't need a separate power supply or power outlet for each device. The battery-powered Mac Portable and PowerBooks, however, require low-power ADB devices designed to draw less juice — more about this later.

Before connecting or disconnecting an ADB device, first shut off the Mac, or it may fail to recognize one or more of the devices. Another incentive to turn off the Mac is that ADB connectors may short-circuit momentarily when installed or removed, damaging the input device or the Mac itself. Some people who travel with a Mac have also reported problems with the connectors wearing out after repeated use, so it's wise not to attach and detach ADB devices too frequently.

Apple offers several keyboards for the Mac — the Macintosh Plus keyboard (discontinued in October 1990), the Apple Keyboard, and the Apple Extended Keyboard II. The Mac Plus and portly Portable included their own keyboards; the Apple Keyboard is included with the Classic II, LC III, and most Performa models. There's also the Apple Adjustable Keyboard, which is covered in Chapter 24.

The Apple Keyboard, Extended Keyboard II, and the Apple Adjustable Keyboard are also sold separately; when you buy a Centris, Quadra, or PowerBook Duo Dock, you need to choose a keyboard. The Apple Keyboard is similar to the old Mac Plus keyboard, with a standard typewriter layout supplemented by four arrow keys for moving the Mac's blinking insertion point, and a calculator-like *numeric keypad* for fast number entry. Many word processors also use the numeric keypad for scrolling.

The Apple Extended Keyboard II supplements the standard keyboard's typewriter, arrow, and numeric keypad keys with additional scrolling keys and a row of 15 *function keys*. Many programs use the function keys as keyboard shortcuts for often-used menu commands. You can also create your own function-key shortcuts using a macro utility such as CE Software's QuicKeys 2 or Affinity Microsystems' Tempo II (see Chapter 25).

Make mine extended

I recommend an extended keyboard for anyone with enough desk space to accommodate it. Even if you never create any macros, you'll find its additional scrolling keys useful for navigating through documents. What's more, the Extended Keyboard II provides adjustable feet that let you tweak the keyboard's angle for comfortable typing and less hand fatigue. Its layout almost matches that of the latest IBM keyboards — useful if you switch between Macs and PCs or use Insignia Solutions' SoftPC software, which lets Macs run IBM PC programs.

(The Extended Keyboard II, as its name implies, represents Apple's second attempt at an enhanced keyboard. The original Extended Keyboard provided an identical layout, but lacked the angle-adjustment feet. If you're buying an extended keyboard, be sure to get the latest model. Its Apple part number is M0312; its predecessor's was M0115.)

The key to power

Apple's ADB keyboards also offer a *power-on key* that turns on a Mac II, Centris, or Quadra. On the Color Classic and LC520, this key turns power off as well as on. With other Macs, the power-on key has no effect. You can, however, put it to work by using Sophisticated Circuits' PowerKey — which provides three outlets that supply juice when you press the power-on key. PowerKey Remote lets you activate power over the phone — handy for fax modems or for use with AppleTalk Remote Access (described in Chapter 33).

Competing keyboards

If you haven't bought a keyboard yet, or if you're thinking of upgrading from a standard to an extended version, consider a non-Apple keyboard. Not only do these products cost less than Apple's Extended Keyboard II, many offer useful features — missing from Apple's models — providing even more value for the money. For example, most alternative keyboards provide a useful comma- and period-lock feature that prevents you from getting angle-bracket symbols (< or >) when you press the comma or period key while holding down the Shift key.

Comparing keyboard alternatives

One popular alternative keyboard is Datadesk International's Mac-101E, available in an ADB and non-ADB version, which includes a macro utility and provides a layout nearly identical to that of the Extended Keyboard II. The primary difference is that the Mac-101E provides just one set of the Control, Option, and ⌘ keys, while Apple's keyboard provides two, one on either side of the spacebar.

key tronic Corporation's MacPro Plus provides a layout similar to that of the Extended Keyboard II, but with a larger Return key that supposedly reduces data entry errors. The MacPro Plus is available for ADB Macs only. key tronic's Trak Pro is a keyboard with a built-in trackball.

Possibly the most interesting alternative keyboard is Datadesk International's modular-design Switchboard. It lets you remove the keyboard's numeric keypad, for example, and replace it with a trackball, which I'll describe shortly. You can even get function-key modules that contain their own memory for storing macros and custom keyboard shortcuts.

Don't buy until you try

But there's another, more subjective, reason to consider a non-Apple keyboard — how it feels. The pressure required to generate a keystroke, how well the keys respond to fast typing, the sound they make when pressed and released: These characteristics combine to give every keyboard its own personality. If you find Apple's keyboards uncomfortable or unresponsive, give the competition a try. But remember, you will stroke those keys millions of times, so don't buy a keyboard until you've test-driven it.

Pointing Alternatives

Since its invention in 1964, the mouse has become the world's premier pointing device. Apple builds a first-rate rodent that meets most users' needs — and, unlike a keyboard, it's conveniently included with each machine (see the Background box "A Field Guide to Apple Mice"). But tastes in input devices do vary, and certain tasks benefit from a different approach to pointing.

Although Apple's mice are among the best, they're mechanical beasts prone to wear and breakdown. The mouse mechanism uses a rubber ball that requires a smooth surface on which to roll, lest the pointer jerk across the screen. The ball and the rollers it touches accumulate dirt and require periodic cleaning. An extremely dusty environment — a factory, a wood-heated house, or my office — can choke an Apple mouse to death.

Mouse racing

A mouse that doesn't share these shortcomings is Mouse Systems Corporation's aptly named Little Mouse. Designed for ADB-equipped Macs, the Little Mouse is an *optical* mouse: Rather than measuring the movement of a rubber ball, it measures

BACKGROUNDER

A Field Guide to Apple Mice

Apple has shipped several mice over the Mac's lifetime. One species is electro-mechanical, using the ball to drive two wheels whose edges are ringed with metallic encoders. A current is made and broken as the encoders spin past electrical contacts. The other mice use the opto-mechanical design described in this chapter.

Here's how to tell the rodents apart:

- The electro-mechanical ADB mouse has a heavy gray ball with a sliding retainer ring and is made in the United States.
- The first opto-mechanical ADB mouse has a lighter black ball with a rotating retainer and is made in Taiwan. Some people complain that this mouse's lightweight ball prevents smooth pointer movement.
- The second ADB opto-mechanical mouse has a heavy gray ball with a rotating retainer and hails from Malaysia.
- The newer Apple Desktop Bus Mouse II has a comfortable, rounded shape. Its ball is located closer to the front of the mouse, a location that Apple says allows for more precision with less hand effort.

Incidentally, the original Apple mouse — the non-ADB mouse — was born in 1983 along with Apple's Lisa and the Apple IIe. The Macintosh 128K, 512K, 512K Enhanced, and Plus used this mouse. Apple still uses this mouse for the Apple IIe and IIc.

the light reflected from a 7 by 8-inch pad covered with a grid of minute dots (see Figure 34-1 "How Pointing Devices Work").

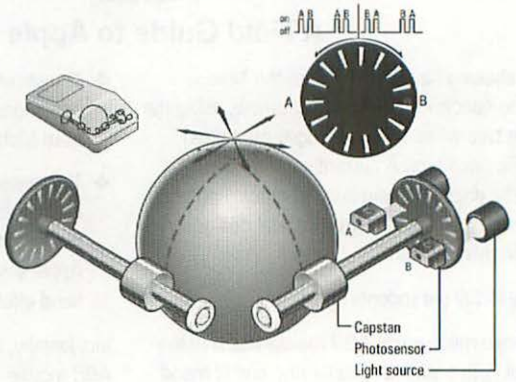
Aside from its button, the Little Mouse has no moving parts to wear out or get cheesy. It's also smaller and lighter than an Apple mouse. The required mouse pad does add to desktop clutter, but many people prefer to use a mouse pad even with a conventional mouse because the mouse glides nicely on a pad's smooth surface. I used a Little Mouse for a few weeks and found it a worthy alternative to an Apple mouse. (I also switched back to my Apple mouse, so I suppose that says something, too.)

Another contender is Mouse Systems' A3 mouse, for ADB-equipped Macs. It has not one button but three, and lets you program them to issue ⌘-key sequences or execute macros. People who use Apple's AU/X version of the UNIX operating system may like the A3 especially well, because UNIX windowing systems often use a three-button mouse.

HOW POINTING DEVICES WORK

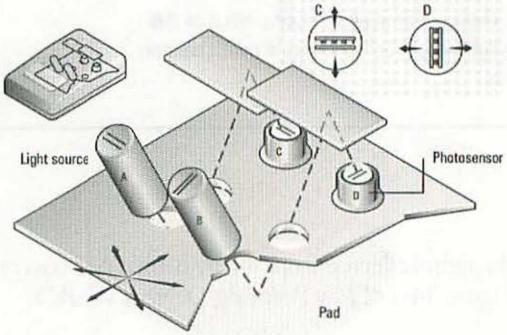
Mechanical Mouse

In an Apple mouse, a rubber ball touches two capstans, which are connected to slotted wheels sandwiched between two light-source-and-photosensor pairs (A and B). When the ball rolls, the capstans turn the wheels, whose slots interrupt the light. Each interruption is interpreted by the Mac as one increment of movement. The sensors are offset slightly so that, as the wheels turn, they produce a pair of signals with a pause between. The direction a wheel turns is indicated by which sensor, A or B, produces the first signal in each pair. Trackballs work similarly, except only the ball (not the entire housing) moves.



Optical Mouse

In an optical mouse, light from two light sources (A and B) reflects off a pad covered with a fine grid of dots. The image of the grid is projected onto two separate photosensors. One senses vertical movement (C) and the other horizontal movement (D). As the reflection of the grid passes over the sensors, circuitry within the mouse counts the dots to determine the distance the mouse has moved in either direction.



Tablet with Stylus

In a graphics tablet, a drawing stylus or cursor exchanges minute radio signals with the tablet through a grid of wires that crisscross the drawing area. The tablet determines the location of the stylus and transmits the location information to the Macintosh. The stylus doesn't need to touch the tablet surface itself; this means you can trace a drawing, even through several pages of a book.

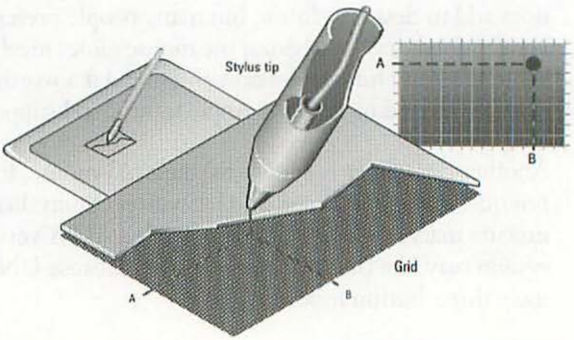


Figure 34-1: How Pointing Devices Work

For those who like the mouse but not its tail, there are Spark International's Spark Cordless Mouse and Z-NIX Company's Cordless Super Mouse. Both use an infrared link instead of a wire. They run on rechargeable batteries and provide a sleep mode that conserves juice when they aren't moving.

Pointing without rolling

But even a tailless mouse requires some desk space in which to roam. If you just can't spare that kind of real estate, consider a *trackball* — a plastic ball that sits on rollers housed within a small case that, like a keyboard, occupies a fixed location on your desk. To move the Mac's pointer, you roll your fingers across the trackball. A trackball's ability to fit and work in a small space is what makes it the pointing device on PowerBooks.

Most trackballs provide two buttons. One works just like a standard mouse button, while the other works like a mouse button that sticks. This second button lets you drag icons, windows, or other items without holding down a button: Click the button once to start dragging, and then click it again to stop. By giving your hand one less chore to perform, a locking-click button can help you make more precise pointer movements, and it eliminates the finger fatigue that hours of delicate dragging can cause.

Comparing trackballs

Some trackballs — such as Kensington Microware's Turbo Mouse ADB and Mouse Systems' A3 Trackball — let you combine both buttons to perform special tasks. For example, you can configure it to issue an often-used keyboard command, such as ⌘-S for Save. This technique of pressing two or more buttons simultaneously is called *chording*.

Other ADB-compatible trackballs include EMAC's sleek Silhouette; MicroSpeed's three-button MacTrac; and Kraft Systems' two-button Trackball ADB and Curtis Manufacturing's MVP Mouse, both of which can accept an optional foot pedal for clicking.

From the fashion angle, it's hard to beat the custom-colored balls that Kensington sells for its Turbo Mouse. Available in pearlescent blue, purple, or red as well as in solid black, they look like tiny bowling balls.

Something to consider when trackball shopping is the size of the ball itself. Some people find that a smaller sphere gives more control. See how comfortable you are with the size and position of the trackball's buttons; they vary from one trackball to the next. And if you're left-handed, opt for a trackball that lets you reverse the functions of the single-click and locking-click buttons.

Tips for Avoiding the PowerBook's Trackball

A PowerBook's trackball is harder for many people to operate than a mouse. The trackball on the PowerBook Duo models can be especially frustrating thanks to its small size: It's only 11mm in diameter, versus 33mm on big PowerBooks.

The best way to avoid problems with the trackball is to avoid using it. Every large PowerBook model has an Apple Desktop Bus (ADB) port into which you can plug a conventional mouse. The PowerBook Duo models can connect to a mouse when docked to a Duo MiniDock or Duo Floppy Adapter. Be sure to use a low-power mouse: It has a symbol on the bottom of it that looks a bit like a *C*.

You can often avoid using the trackball by relying on the keyboard for scrolling, issuing commands, and even selecting icons. This is a good excuse to memorize your programs' ⌘-key shortcuts — and to seek out programs that offer a wide selection of them.

It's also a good reason to buy a keyboard-enhancement utility such as CE Software's QuicKeys to create your own keyboard shortcuts. As I describe in Chapter 25, you can create keyboard shortcuts that open desk accessories and control panels as well as frequently used files.

The PowerBook's system software contains a large selection of keyboard-navigation options. You can use the keyboard to select icons, choose devices in the Chooser, and start programs. For details on the Finder's keyboard-navigation options, see the section "System 7 Keyboard Shortcuts" in Chapter 23.

Pens and Tablets

As effective as mice and trackballs are, they still lack the familiar feel of a pen or pencil, making them second-best tools for drawing and drafting. For these tasks it's hard to beat a *graphics tablet*, also called a *digitizing tablet*. Tablets provide a flat drawing area upon which you scrawl using a pen-like *stylus* whose tip contains a switch that mimics a mouse button.

Most tablets have a drawing area that's covered with a clear plastic sheet, or *overlay*, under which you can tuck artwork to be traced. A newspaper artist may use a graphics tablet and a drawing program such as Aldus FreeHand or Adobe Illustrator to trace a map or diagram to accompany a story. Many tablet pens accept ink-filled cartridges, enabling you to place a sheet of paper on the tablet's surface to see on paper what you're drawing on screen.

Tablet work areas vary widely in size, and as the size increases, so does the price. One inexpensive tablet, CalComp's DrawingPad (for ADB-equipped Macs) pro-

POWERBOOK ANGLE

Input Devices for the PowerBook Line

A PowerBook's input devices are built in, but that doesn't mean there isn't room for improvement. This box lists some alternatives you may consider.

Numeric keypads

If you work with numbers extensively, you can add an external numeric keypad to the PowerBook. Keypads such as Sophisticated Circuits' PowerPad, Plusware's Plusware Numeric Keypad, and Kensington's NoteBook KeyPad allow for calculator-like number entry and also provide Page Up, Page Down, Home, End, and other convenient scrolling keys.

Alternative trackballs

Given that a PowerBook provides a built-in trackball, I'm not sure why you'd want to connect an external one — unless you didn't like the built-in one, that is. If that's the case, consider MicroSpeed's MicroTrac, which provides three programmable buttons.

Keyboards

A PowerBook's keyboard is about 2 percent narrower and 5 percent shorter than Apple's standard desktop keyboards. As a result, the keyboard may feel a bit cramped, especially if you have large hands or you're used to conventional Mac keyboards. So, if you use a PowerBook in the office, you may want to attach an external keyboard — perhaps one that provides the function keys, numeric keypad, and navigation keys that the PowerBook keyboard lacks — to its ADB port.

vides a small work area 7½ inches square. Midrange tablets have work areas of about 8½ by 11 or 12 by 18 inches. Large tablets can provide as much work area as a drafting table. Wacom offers a tablet with a 35 by 47-inch drawing surface.

Absolute versus relative motion

Their pen-on-paper operating style isn't all that makes tablets superior drawing tools. Equally important, tablets are *absolute-motion* pointing devices, while mice and trackballs are *relative-motion* pointing devices. Your blind mouse can't report its physical location: It doesn't know whether it's at the edge of the desk or in the middle. When you pick up the mouse and set it down elsewhere, the pointer doesn't suddenly jump to a different spot on the screen. Mice and trackballs simply report that they're moving a certain distance in a certain direction.

In contrast, each point on a graphics tablet corresponds to a point on the Mac's screen. Pick up a tablet's stylus and then touch it to a different part of the drawing area, and the Mac's pointer *does* suddenly jump to a different part of the screen.

It's this operating style that makes tablets ideal for tracing and drawing. Most tablets also provide a relative-motion mode that you can use when you want mouse-like operation.

Graphics tablets are also better able to discern small degrees of movement. Mice and trackballs can generally discern 200 to 300 units of movement per inch, but graphics tablets typically detect 1,000 units or more per inch. The higher a pointing device's resolution, the better suited it is to precise drawing, because it's able to register even minute movements.

Pressure-sensitive tablets

For artists, the most exciting graphics tablets are pressure sensitive. With tablets such as Wacom's SD series, pressing harder with the stylus gives you a darker or wider line. But there's a catch: You need a graphics program that responds to the pressure information the tablet sends. Wacom tablets include driver files that enable Deneba's UltraPaint and Aldus SuperPaint to respond to pressure. Fractal Design's Painter, Adobe Photoshop, Adobe Illustrator, and Aldus FreeHand support Wacom tablets directly.

Another desirable, if costly, trait in a tablet is the ability to work with a cordless pen. By eliminating the pen-to-tablet umbilical, tablets such as Wacom's SD series and Kurta's IS series take one more step toward providing a natural-feeling drawing surface. Most tablets, including Wacom's and Kurta's, also accept a mouse-like *cursor* containing a lens with cross-hairs that aid in precise positioning.

Finally, to help earn their keep, many tablets accept *command templates* that give you one-click access to frequently used commands. A template package includes a disk and a printed sheet that slips beneath the tablet's plastic overlay and contains labeled boxes in which you click to issue commands. Of course, locating the right box and then clicking in it can take as long as choosing the command with the mouse. But it never hurts to have another option for choosing commands, and some people do find templates ideal alternatives.

Talk To Me

Apple's AV Macs and PlainTalk voice-recognition technology enable you to use some hardware of your own — your mouth — as an input device. PlainTalk can aid users who have disabilities and it enables you to rest your wrists now and then by choosing menu commands and activating palette tools with spoken commands.

Specialized Input Devices

Keyboards, mice, trackballs, and graphics tablets represent the mainstream of input devices. In the backwaters are some specialized devices, which are described in this box.

Joysticks

Anyone who's seen a video game has seen a joystick; it's a moving appendage similar to a car stick-shift with a button on top. Advanced Gravis' MouseStick II and Kraft Systems' KM-30 also provide buttons alongside the stick. The MouseStick II provides several goodies, including adjustable stick tension and programmable buttons that transmit commands when pressed. Joysticks remain best suited to game playing, but they can also be used as mouse replacements.

A distant cousin to the joystick is Altra's Felix, for ADB-equipped Macs. Felix uses a short, stubby stick that moves within a one-inch area. Altra says the stick's tight area of travel makes it feel more precise and natural than a mouse or conventional joystick. Felix was previously marketed by Lightgate Systems, but Altra says it's improved the stick's precision and features considerably.

Devices for handicapped users

Several input devices have been created for handicapped users who are unable to operate a keyboard or mouse. Prentke Romich Company's (Wooster, OH) HeadMaster headset enables users to direct the mouse pointer by moving their heads. A control unit measures the change in the headset's position and reproduces the electrical output of a desktop mouse. A puff switch on the headset replaces the mouse button — blowing into the switch is the same as pressing the mouse button.

The Standard HeadMaster has a wire running from the headset to the computer. The Remote HeadMaster replaces this wire with an infrared link that enables a user to leave the work station without assistance. Prentke Romich Company sells programs that put an image of a keyboard on the screen and enable text to be entered by pointing to the desired letter and activating the puff switch. The software provides word-prediction features that finish words for you and other functions that increase writing speed.

Pointer Systems' (Burlington, VT) FreeWheel also enables users to move the mouse cursor by moving their heads. FreeWheel consists of a small reflector, about the size of a quarter, worn on the forehead. An optical camera sits on top of the computer display and tracks head movement. FreeWheel also includes a desk-mounted puff switch. For typing copy, FreeWheel includes keyboard emulator software called FreeBoard.

Touch screens

For a while, it was thought that touch-sensitive computer screens would be ideal alternatives to desktop pointing devices. In the early eighties, Hewlett-Packard even released a computer with a built-in touch screen. It flopped, partly because no popular software supported it, but also because users' arms got tired.

Touch-sensitive screens do have their place, however. They're often used for computerized directories or information kiosks in department stores, museums, trade shows, and the like. They're also useful in factory environments where there aren't any desktops.

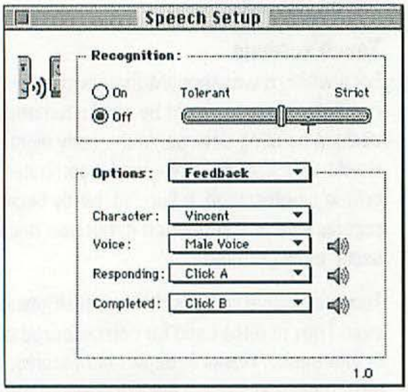
Microtouch Systems' Mac 'n' Touch SA-14 is a 14-inch touch-sensitive color monitor that includes a driver for translating touch to pointer movement. And a variation on the theme is MicroTouch's UnMouse, a touch-sensitive desktop pad.

The AV Macs include utilities for creating voice-activated macros that open files, scroll windows, adjust system settings, and select palette tools. You can also open often-used files by placing them (or aliases of them) in the Speakable Items folder, within the Apple Menu Items folder. PlainTalk also lets you choose menu commands in any application program that uses standard MENU resources. (Most programs do, although Microsoft Word does not.)

Activating voice recognition

You activate PlainTalk's voice-recognition features by using the Speech Setup control panel, shown in Figure 34-2 "Listen Here, Mac." Speech recognition requires roughly 2MB of system memory. (Given this and the memory required by PlainTalk's text-to-speech features, and it's easy to see why the AV Macs ship with 8MB of memory.) To reduce the amount of memory used for speech, select a compressed voice for feedback to spoken commands, or set feedback to None rather than having voice feedback.)

If you're using an AudioVision 14 monitor, be sure to connect the sound-in plug to the external sound imput port on the back of the computer, and that the AudioVision's built-in microphone is turned on.



Speech Setup

Recognition:

○ On

● Off

Tolerant — Strict

Options: Feedback

Character: Vincent

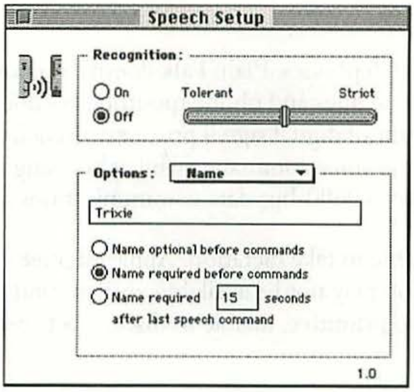
Voice: Male Voice

Responding: Click A

Completed: Click B

Figure 34-2: Listen Here, Mac You activate PlainTalk speech recognition using the Speech Setup control panel. The Tolerance slider lets you adjust recognition: Moving it closer to Strict results in more accurate recognition, although the system may ask you to repeat commands more often. Moving the slider closer to Tolerant reduces the need to repeat commands, but increases the chances of the machine picking up background speech or noise and interpreting it as a command.

Normally, PlainTalk is set up to require you to speak a name before reciting a command — just as a dog trainer gets a pup's attention by saying its name before giving a command. PlainTalk's preset name is *computer*. As Figure 34-3 "Name That Mac" shows, you can use the Speech Setup control panel to change that, but it's worth noting that Apple fine-tuned PlainTalk to be particularly sensitive to the word *computer*. If you find your Mac isn't listening as well as you'd like, it may be because you gave it a name that it has trouble understanding.



Speech Setup

Recognition:

○ On

● Off

Tolerant — Strict

Options: Name

Trixie

○ Name optional before commands

● Name required before commands

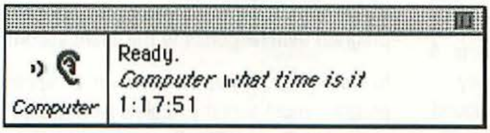
○ Name required 15 seconds after last speech command

1.0

Figure 34-3: Name That Mac With an AV Mac's Speech Setup control panel, you can specify a name for the Mac. When issuing spoken commands, you precede the commands with the name. You can also specify whether the name is required or optional.

You can also disable the name requirement, but this has a risk: The Mac could overhear you and perform a command you did not intend it to. Imagine telling a coworker, "The branch office has shut down," and then turning to your Mac to find it's turned itself off.

When voice recognition is on, PlainTalk displays a feedback window that shows the commands you've given (see Figure 34-4 "Monitor Your Speech"). If PlainTalk doesn't recognize a command, the window displays the message, *Pardon me?*



Computer

Ready.

Computer what time is it

1:17:51

Figure 34-4: Monitor Your Speech PlainTalk's speech recognition feedback window displays commands and responses. The small sound waves adjacent to the ear (which is named Vincent), indicate that the computer's microphone is picking up sound.

Speech limitations

Although the AV Macs can serve as telephones, PlainTalk doesn't support speech recognition over the telephone: Phone lines and phone mouthpieces don't provide the required fidelity. Also, the amount of digital signal processing required for voice recognition means you can't use voice commands while also using the AV Mac's GeoPort connector to conduct a 9600-bps data communications session.

Also, don't expect PlainTalk to be able to take dictation. Apple engineers have told me that this kind of voice recognition may not be available until around the turn of the century. Today's systems are too primitive, unable to discern between *two* and *too*, for example.

Until that next big breakthrough occurs, keyboards and mice will probably remain the preeminent input devices. And when you think about it, do you really want to work in an office full of people who are barking at their computers?

BACKGROUNDER

How PlainTalk Recognizes You

Third-party voice-recognition products such as Articulate Systems' Voice Navigator require extensive training: You sit in front of a microphone and repeatedly speak the words you want the system to recognize. Thereafter, the system compares what you said to what it knows, looking for matches.

PlainTalk doesn't require advance training. Apple digitized hundreds of voices and developed methods of isolating and identifying the sound characteristics that transcend individual voices and even dialects. A sibilant *s,* a percussive *k,* a long *o:* The frequency patterns produced by these and other spoken sound, are generally consistent regardless of dialect or inflection. PlainTalk can recognize 51 distinct building blocks of speech, which are called *phonemes.*

When you issue a spoken command, an AV Mac's analog-to-digital converter generates a stream of digital data from the analog signal produced by the microphone. The AV Mac's DSP chip and its Apple Real-Time Architecture operating system analyze this data to determine the volume of various frequencies. The Mac then compares the results to its database of phonemes, making tens of thousands of comparisons and decisions within a few milliseconds. (If that sounds impressive, remember that a puppy can do the same thing — and detect emotion, too.) When PlainTalk determines that it has recognized a word, it generates an Apple event message that is sent to the active application program. The program then responds to the event accordingly.

In order to be fully voice operated, an application program must support Apple's AppleScript (discussed in Chapter 25). If your favorite programs don't yet support AppleScript, you can still create simple voice activated macros using QuicKeys and the Speech Macro Editor included with an AV Mac. And you can issue menu commands if the program uses standard MENU resources.

CHAPTER 34 CONCEPTS AND TERMS

- The mouse is the cornerstone of the Mac's graphical environment, but the keyboard is an essential component for typing-intensive tasks such as word processing, data management, and spreadsheet analysis.
- Mice come in several forms. Besides the standard Apple mouse, there are optical mice that measure the light reflected from a pad covered with a grid of tiny dots; multiple-button mice whose extra buttons let you issue ⌘-key sequences; and cordless mice that use infrared links instead of wires.
- A trackball is a mouse alternative comprising a plastic ball that sits on rollers housed within a small case. You move the pointer by rolling the trackball with your fingertips.
- For drafting and drawing applications, a graphics tablet is often preferred to the mouse.
- Other alternative input devices include joysticks, touch-sensitive screens, and head-mounted pointing devices designed for handicapped users.
- Apple's PlainTalk voice-recognition technology, available in AV Macs, enables you to issue spoken commands.

absolute-motion pointing device
A pointing device, such as a graphics tablet, that can report its position to the Mac. Compare with *relative-motion pointing device.*

chording
The technique of pressing two or more mouse or trackball buttons simultaneously.

cursor
A mouse-like device, used with a graphics tablet, that contains a lens with cross-hairs that aid in precise positioning.

function keys
Special keys, present on some keyboards, that often correspond to often-used menu commands. You can also create your own function-key shortcuts using a macro utility such as CE Software's QuicKeys 2.

graphics tablet
Also called a *digitizing tablet,* an input device that provides a flat drawing area upon which you scrawl using a pen-like *stylus* whose tip contains a switch that mimics a mouse button. Some tablets are pressure sensitive. Most tablets have a drawing area that's covered with a clear plastic sheet, or *overlay,* under which you can tuck artwork to be traced.

numeric keypad
A small keyboard (or portion of a keyboard) that provides a set of number keys arranged in a calculator-like layout for convenient number entry. Many word processors also use the numeric keypad for scrolling.

optical mouse
A mouse that detects movement by measuring not the rolling of a rubber ball, but the light reflected from a pad covered with a grid of minute dots.

pointing device
A hardware peripheral that lets you control the position of the Mac's on-screen pointer. The most common pointing device is a mouse.

power-on key
On a Mac keyboard, the key with a hollow, left-pointing triangle. On a Mac II, Centris, or Quadra family machine, pressing the power-on key switches the Macintosh on. On other Macs, the power-on key has no effect.

relative-motion pointing device
A pointing device, such as a standard mouse, that simply reports that it's moving a certain distance in a certain direction. A relative-motion pointing device can't report its physical location: For example, it doesn't know whether it's at the edge of the desk or in the middle. When you pick up the mouse and set it down elsewhere, the pointer doesn't suddenly jump to a different spot on the screen.

trackball
A mouse alternative comprising a plastic ball that sits on rollers housed within a small case that, like a keyboard, occupies a fixed location on your desk. To move the Mac's pointer, you roll your fingers across the trackball.

CHAPTER THIRTY-FIVE

Power Protection

IN THIS CHAPTER

- Surveying power problems
- Protecting your system from surges and sags
- Shopping for power-protection devices

Anyone who has watched an hour's worth of unsaved work vanish into the black hole of a darkened screen knows how traumatic a power failure can be. One minute you're hard at work, and the next you're staring stupefied at a blank piece of glass.

Mac Lesson Number One: The power to be your best only exists when there's power.

But of all the power problems that can occur, power failures constitute a relatively small percentage. A variety of gremlins lurk on the other side of a wall outlet, and some of them can turn a Mac's lights out for good. In this chapter, I look at the kinds of mishaps you may encounter, and describe how susceptible your system is to them. Finally, I describe some add-ons that ensure the Mac a healthy flow of juice.

Current Events

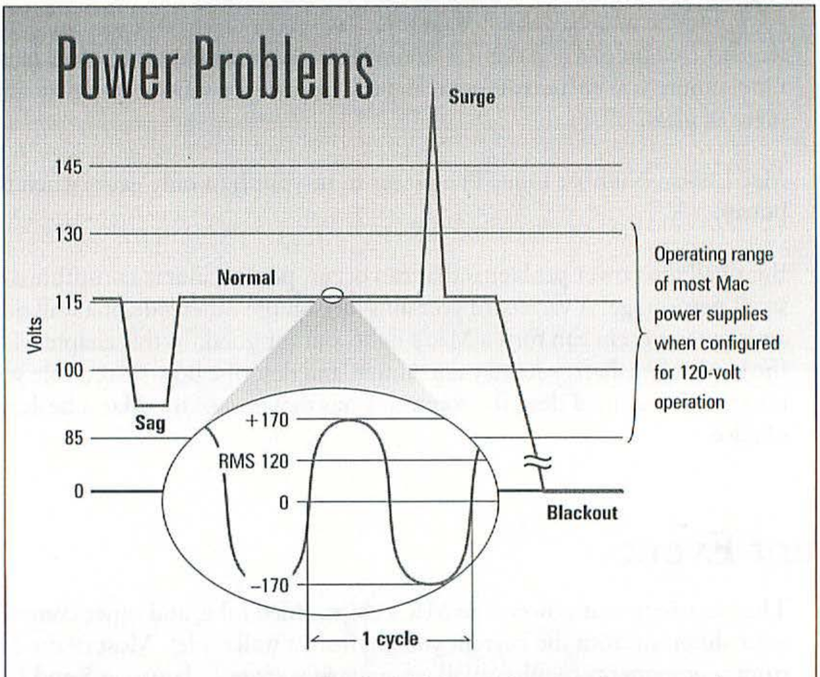
The electricity that powers the Mac's chips, video tube, and other components is quite different from the current you get from a wall outlet. Most of the Mac's electronic components require small amounts of voltage — between 5 and 12 volts — but a wall outlet supplies roughly 120 volts (in the United States and Canada, that is; in Europe, 220 or 240 volts is standard, and elsewhere you may find either 120- or 220-volt systems).

What's more, the Mac's components require *direct current* (DC), while a wall outlet supplies *alternating current* (AC). DC travels continuously, while AC reverses its direction at regular intervals — generally, 60 times per second with 120-volt systems and 50 times per second with 220-volt systems.

All desktop Macs contain a power supply that turns AC voltage from the wall outlet into direct current at the voltage levels needed by the Mac. The power supply also contains filtering circuits that smooth variations in the original current.

A Field Guide to Power Problems

It's those variations that can cause problems. The electricity a power company supplies may seem like pretty consistent stuff, but it isn't. Its voltage fluctuates — sometimes dramatically — and it's prone to various types of *noise*, or interference. Figure 35-1 "Power Problems" illustrates the most common types of power flaws.



Incoming voltage averages 115 to 120 volts, but it drops during sags or brownouts, and momentarily soars during surges. The inset shows one cycle of alternating current (AC), 60 of which occur each second. Note that the sine wave's peak and trough reach values of +170 and −170 volts. The root-mean-square, or RMS, voltage value, which can be thought of as an average value, is 120 volts. Macintosh power supplies draw their power at the peak of each sine wave.

Figure 35-1: Power Problems

No power at all

Outages, or *blackouts*, occur when the power goes out completely. An overloaded circuit can cause a localized blackout in part of a house or building, while storms and downed power lines usually cause prolonged, area-wide outages. Momentary blackouts can also occur when a utility company switches between various power-distribution circuits while isolating a problem in the lines. Although such blackouts usually last only a fraction of a second, they can go on for several seconds (on the rural northern California coast where I live, longer ones are more common).

Not enough power

Sags occur when the voltage available at the wall outlet drops below roughly 105 volts. Also called *brownouts*, sags can occur when a sudden load is placed on a circuit — such as when an air conditioner or some other power glutton is turned on. Sags can also occur when an electric utility company lowers the voltage in order to reduce demands on its generating equipment during periods of peak usage, such as sweltering summer days and frigid winter nights. Sags generally won't damage the Mac, although a very large one could cause a system error.

Too much power

Surges occur when incoming voltage increases by astronomical amounts for a very brief period (on the order of a few milliseconds, or thousandths of a second). Surges, also called *transients* or *spikes*, can occur when lightning strikes in your vicinity or when the power comes back on after a blackout. Small surges (under 1,000 volts) can be caused by the electric motor in a refrigerator or other appliance turning off and are more common than large surges (1,000 volts or more). A large surge can damage anything that's connected to the circuit; a small one generally won't cause permanent damage but can produce a system error and some lost work. Surges as a whole are less common than sags.

Noisy power

Noise covers a range of flaws that affect the quality, not the quantity, of power present. A large electric motor can transmit noise into wiring that can interfere with radio or television equipment on the same circuit. This kind of noise, called *electromagnetic interference* (EMI), generally doesn't affect computer equipment.

The First Line of Defense

How vulnerable is the Mac to blackouts, sags, and surges? Judging from the number of power conditioning products available — and by the alarmist advertising some manufacturers use — you may think it's a sitting duck, ready to be humbled by the first surge or sag that comes down the wire.

Not so. The power supplies in the Mac family are designed with sags and surges in mind. Apple's power supplies are designed to work with as little as 85 volts, so the Mac shouldn't blink during brownouts. Mac power supplies can even provide enough juice to keep the machine running during a very brief blackout, the kind caused when utilities switch distribution networks. Apple's power supplies are designed to provide 20 milliseconds of current to a Mac running at what engineers call *full load* — all floppy and hard drive motors on, keyboard and mouse in use, all expansion slots filled, the processor hard at work, and all rear-panel connectors in use at the same time. Because a Mac rarely operates at full load, the power supply can carry you through an outage of a second or two — depending on what's connected to your Mac and how it's being used when the outage occurs.

All Macs are designed to withstand surges of up to 5,000 volts. Indeed, the power supplies in most computer equipment have at least some surge protection built in.

So Who Needs Power Protection?

So the Mac's power supply tolerates low-voltage conditions and stands up to surges. Why, then, does an entire industry revolve around power protection? For one thing, no power supply provides enough juice to span an outage lasting more than a couple of seconds. Also, surge resistance varies from one piece of equipment to the next; your Mac may withstand a surge, but will your modem, external hard drive, monitor, and scanner?

And many power-protection devices offer convenient features, such as a single switch that turns everything on and off, or separate front-panel switches for each item plugged in to the device. Finally, there's the chicken-soup factor: A second stage of power filtering and surge protection can't hurt, and it may well help.

Suppressing the Urge to Surge

The most popular power-protection device is the *surge suppressor*, which you install between the wall outlet and your computer gear. It reduces incoming surges to innocuous voltage levels. Surge suppressors don't help when the power sags, but they are the least-expensive power protectors.

Surge suppressor considerations

When shopping for a surge suppressor, you face a barrage of jargon and a variety of features, some convenient, some essential. In the jargon department, the two most important specifications are *clamping voltage* and *response time.* The clamping voltage is the point at which the surge suppressor kicks in and starts suppressing; voltages below the clamping voltage are sent along to the equipment. Thus, the lower the clamping voltage, the better; a 340- to 400-volt clamping voltage is best.

Response time is the time required for the surge suppressor to close its electronic gate and prevent the surge from getting through. The faster the response time, the better, because it means less of the surge sneaks through to the computer. Look for a response time of about 10 nanoseconds or less.

You may also see an *energy dissipation* specification. This refers to how much juice the surge suppressor's circuitry can absorb before it fails and simply passes the surge on to ground, an event that won't harm your equipment but will blow out the surge suppressor. Energy dissipation is measured in joules; the higher the value, the more durable the surge suppressor. Inexpensive surge suppressors generally absorb about 50 joules, while heavy-duty suppressors can absorb 300 or more joules.

The easy way to buy a suppressor

The easiest way to choose a good surge suppressor is to make sure it meets Underwriters Laboratory (UL) specification 1449. (UL 1449 refers to a battery of torture tests, themselves described in another cleverly named document, IEEE 587.) A suppressor that complies with IEEE 587 is desirable, but the UL 1449 designation is preferable, because it means an independent laboratory, not the suppressor manufacturer, tested the device. It isn't enough for a suppressor to simply be UL listed; look specifically for the UL 1449 designation.

Beyond technical specifications, there are other factors you may want to consider (see the Background box "A Guide to Surge Suppressor Features").

Complete Power Protectors

For protection against sags and brief blackouts as well as surges, you need a *standby power supply,* which installs between your equipment and the wall outlet and contains batteries that provide from 5 to 30 minutes of power. That's more than enough power to span a brief outage or give you time to save and shut down during longer ones.

BACKGROUNDER

A Guide to Surge Suppressor Features

If you're in the market for a surge suppressor, look beyond the basics and determine whether the suppressor you're considering provides the features listed here.

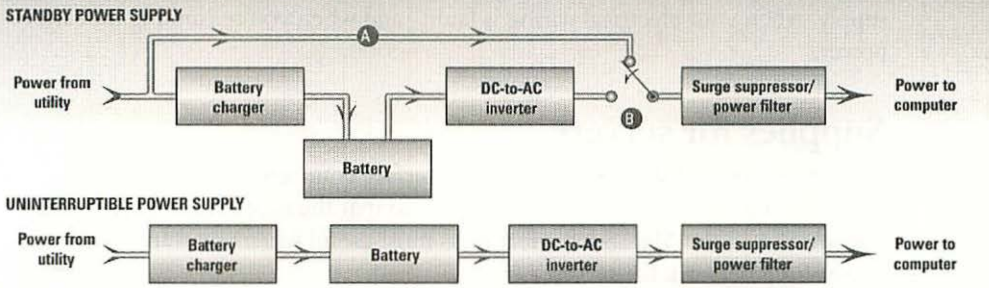
- *Connections between hot, neutral, and ground* Inexpensive surge suppressors (in the $10 to $20 range) protect only between the hot (current-carrying) and the neutral wires of a wall outlet. For complete protection, you also need protection between the neutral wire and the ground wire (the round hole below the two rectangular ones on a wall outlet) and between hot and ground wires. This scheme is often described as providing "three-way" protection.
- *Modem protection* A lightning-induced surge can enter the phone lines and fry a modem. Some suppressors provide jacks for a modem or fax machine, a desirable feature for lightning-prone areas. Another UL designation, UL 497A, indicates that a suppressor can successfully protect such communications equipment.
- *Number of outlets* Most surge suppressors provide several outlets, and must also provide a master power switch. Some also provide individual switches for each outlet. Some suppressors, such as Curtis Manufacturing Company's Curtis Command Center, are designed to sit beneath a monitor, providing a swivel base for it, and they have a power switch for each outlet.
- *Failure alarm* A surge suppressor can fail after absorbing too large a surge; better units provide an alarm that indicates when the suppressor circuit has failed. An alarm may consist of an indicator light (handy if the suppressor is close to your system), an audible buzzer (good if the suppressor is under your desk, out of eyeshot), or both (best).

A standby power supply is often called an *uninterruptible power supply* (UPS), but in fact there's a difference between the two. With a UPS, computer equipment runs continuously from the power supply's batteries, which are constantly being recharged. By contrast, a standby power supply's batteries don't kick in until the power goes off (see Figure 35-2 "How Standby and Uninterruptible Power Supplies Work"). A standby power supply generally costs less than a true UPS and is just as reliable. A standby supply kicks in within milliseconds of an outage or sag, and as I mentioned earlier, the power supplies in your hardware will continue to provide power during that period.

Matching the supply to the demand

The amount of power a standby supply can provide depends on what's connected to it. The greater the load on the supply, the faster its batteries will discharge. What's more, if you exceed a standby supply's current rating, you will eventually blow a fuse in the supply. (Better-quality supplies have overload indicators that

How Standby and Uninterruptible Power Supplies Work



In a standby power supply (top), the computer normally runs off incoming AC power (A). When the power level drops below a certain voltage (usually 100 to 105 volts), a relay (B) switches power to the standby supply's circuitry, which comprises a bank of batteries and an inverter that converts the batteries' DC voltage to AC. With a true uninterruptible power supply (bottom), the computer always runs off the batteries, which are kept recharged. Such supplies have no real advantage over standby supplies, since the Mac's power supply can provide more than enough current to span the several milliseconds that elapse before the standby supply switches to battery power.

Figure 35-2: How Standby and Uninterruptible Power Supplies Work

light when you're drawing too much current.) Thus, it's important to match the supply to your hardware.

Standby and uninterruptible power supplies are usually rated in *volt-amps.* A unit rated at approximately 100 volt-amps will power a typical Mac Classic with a hard drive for at least 15 minutes. Such supplies generally cost between $200 and $400. For a modular Mac machine with a color monitor, you need a supply that provides 300 to 400 volt-amps, at a cost of $400 to $500. For a 19-inch monitor, make that at least 400 to 500 volt-amps and $500 to $700. Add another 100 volt-amps to include an external hard drive or tape backup device.

Printers need not apply

Don't bother providing standby power to your laser printer: You'd need a supply rated at 1,000 volt-amps or more, and they cost between $1,000 and $2,000. And given the fact that you won't lose any work if the laser printer loses power anyway, it makes more sense to simply protect the printer from surges.

Shopping for Standby Power

Many of the shopping considerations behind surge suppressors apply to standby power supplies too. Some supplies provide only one rear-panel outlet; others provide several. Some (such as those made by American Power Conversion's UPS

110SE and UPS 370ci) can sit beneath a Mac or a monitor, while others (such as Kensington Microware's Power Backer series) are designed to sit on the floor. The better ones have several indicator lights that warn you when you're overloading the supply, when your electrical wiring is faulty, and when you're running on battery power.

Supplies for servers

More sophisticated supplies provide an interface connector that lets you attach the supply to the Mac's modem or printer port so that the supply can convey status information to the Mac. Such a feature is most useful when you want standby power for a network file server.

If you want standby power for an AppleShare network file server, consider pairing American Power Conversion's UPS 110SE or UPS 370ci with the company's PowerChute software. These well-designed supplies provide interface connectors that can attach to the server Mac's modem port. The PowerChute software monitors the status information; when the power fails and the power supply kicks in, PowerChute sends a warning to all Macs connected to the server telling them how long the server will remain available.

If the power doesn't return before the standby power is exhausted, all users are safely logged off the server, which is then shut down normally. Of course, only users who weren't victimized by the outage — or who have their own standby power supplies — will see the on-screen warning message, but the warning is only half the value of PowerChute anyway. What's equally important is that the server is safely shut down for you.

No squares allowed

Before buying any standby power supply, make sure it provides either *sine wave* or *stepped-square wave* output. Inexpensive standby supplies often provide *square wave* output, which causes considerable electrical stress to monitors and hard drives that can make them wear out faster. Sine-wave output is the most desirable, because that's what wall outlets normally supply.

QUICK TIPS

More Power Tips

In this box are some additional tips for avoiding lost work due to power problems.

Check your wiring

Neither a surge suppressor nor a standby power supply will help if your electrical wiring is faulty. Be sure your wall outlets' third-wire ground holes are connected to a good earth ground. (Check the point where the electrical service enters your house; you should find a copper rod driven into the ground with a heavy wire connecting it to your wiring.)

Also be sure that your hot and neutral lines are wired properly. You can check them yourself using an inexpensive *line checker* such as Radio Shack's catalog number 22-101. (American Power Conversion's standby supplies contain line-checking features.) To be extra sure, however, double-check with an electrician or your local utility company.

Don't use ground eliminators

Avoid ground eliminators — those little adapters that let you plug a three-pronged power cord into the two-conductor outlets many older buildings have. Defeating the ground conductor makes the Mac more susceptible to power surges. Have an electrician install a properly grounded, three-conductor outlet.

Unplug during lightning storms

The best way to protect equipment against lightning-induced power surges is to unplug the Mac and everything connected to it during a lightning storm. (Don't forget to unplug the modem from the telephone lines.) A lightning bolt is the ultimate surge; don't count on a surge suppressor to protect you from it.

Save and save often

In the end, one of the best ways to avoid losing work because of power problems is free. Simply follow the advice that Fred Parker, a power-supply veteran at Apple, passed along to me — save often.

How Long Will You Standby Me?

Finally, be aware that after several years, you'll need to replace your standby power supply's batteries, which can cost up to 30 percent of the supply's original price. You may want to investigate replacement costs before picking a unit.

Standby power supplies provide more complete protection than surge suppressors but are far less popular. One reason is their cost; another is that they provide only a brief reprieve from darkness. Still, if your power is as unreliable as mine, that reprieve can be priceless. The glow of a Mac screen in an otherwise darkened room is a heartening sight — especially if you haven't saved recently.

CHAPTER 35 CONCEPTS AND TERMS

- The most common power problems are blackouts (no power), sags (lowered voltage), surges (brief but significant increases in voltage), and noise (poor quality power).
- Apple's power supplies are designed to provide some protection against sags, surges, and noise, but they don't offer protection for other hardware you may have, such as a modem or printer.
- The most popular and least expensive power-protection device is the surge suppressor, which reduces incoming surges to harmless voltage levels.
- The two most important surge suppressor specifications are the clamping voltage and the response time.
- For protection against blackouts and sags, you can use a standby power supply, which contains batteries that provide enough power (usually 5 to 30 minutes' worth) for you to save your work and shut down.

clamping voltage
In a surge suppressor, the point at which the surge suppressor kicks in and starts suppressing; voltages below the clamping voltage are sent along to the equipment. Thus, the lower the clamping voltage, the better; a 340- to 400-volt clamping voltage is best.

power supply
A component, present in all computers and peripherals, that turns alternating current (AC) from the wall outlet into direct current (DC) at the voltage levels needed by the device. The power supply also contains filtering circuits that smooth variations in the original current.

response time
In a surge suppressor, the time required for the surge suppressor to close its electronic gate and prevent the surge from getting through. The faster the response time, the better, because it means less of the surge sneaks through to the computer.

sag
A power problem that occurs when the voltage available at the wall outlet drops below roughly 105 volts. Also called *brownouts,* sags can occur when a sudden load is placed on a circuit — such as when an air conditioner or some other power glutton is turned on.

standby power supply
A peripheral that installs between your equipment and the wall outlet and contains batteries that provide from 5 to 30 minutes of power.

surge
A power problem that occurs when incoming voltage increases by astronomical amounts for a very brief period (on the order of a few milliseconds, or thousandths of a second). Surges, also called *transients* or *spikes,* can occur when lightning strikes in your vicinity or when the power comes back on after a blackout.

surge suppressor
An add-on that installs between the wall outlet and your computer gear and reduces incoming surges to innocuous voltage levels.

PART IV

APPENDIXES

Page 799 **Appendix A:** Using the Macworld Complete Mac CD

Page 808 **Appendix B:** How the Book and CD Were Produced

Page 817 **Appendix C:** Macintosh Memory Configurations

APPENDIX A

Using the Macworld Complete Mac CD

This appendix describes the contents of the *Macworld Complete Mac CD* and provides some tips for using the CD.

What's On the CD?

The *Macworld Complete Mac CD* is the electronic companion to the book you're reading now. There are two parts to this CD — the audio program that plays on any compact disc player or audio-capable CD-ROM drive; and the data portion, which contains hundreds of megabytes of free software, shareware, digitized sounds, QuickTime movies, and demonstration versions of many of today's top programs.

At Least Read This!

Even if you don't read this entire appendix, at least read this section: It contains important information about working with the programs on the CD.

Many of the programs in this folder are ready to run directly from the CD-ROM. (Of course, the programs will run much faster if you copy them to a hard disk.) However, some programs may create items in your System Folder that refer to the CD. Specifically, the installer for the screen saver DarkSide of the Mac (in the Best of BMUG collection) creates an alias in your System Folder's Startup Items folder. (Aliases are discussed in Chapter 23.)

If you run the DarkSide installer from the CD, your Mac will ask you to insert the CD every time you start up or restart. Unless you're really nuts about this CD, you probably won't want this. Therefore, if you want to install DarkSide, copy the Dark Side folder to your hard drive and *then* run the installer from the hard drive. In general, this is a good approach to follow when installing a program.

If you find that your Mac is asking for the CD when you start up or that you can't eject the CD (the Mac says some "items are in use"), chances are you ran an installation program that creates an alias in your System Folder that refers to the CD. Check in your System Folder's Startup Items, Control Panels, and Extensions folders for these aliases. (Of course, if the Mac doesn't let you eject the CD, also make sure that no programs or documents on the CD are open.)

As a general rule, it's a good idea to read the "read me" file for a given program to learn about any special installation procedures it may require.

Navigating the CD

When you insert the *Macworld Complete Mac CD*, a window containing a "read me" file and five folders appear (see Figure A-1 "Main CD Window").

The Read Me Now! file contains a quick overview of the CD. Table A-1 describes the five main folder icons.

Exploring the CD's folders

As the next appendix describes, I spent many hours fine-tuning the position of every folder window on the CD. (There are 524 of them.) The result is a window arrangement that I think makes it easy to move around within the CD's folders.

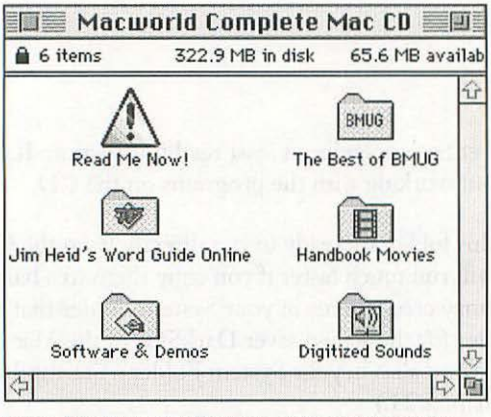


Figure A-1: Main CD Window When you insert the *Macworld Complete Mac CD,* you see the window shown here. If you use System 7, you see the custom icons shown here. If you use System 6, you see standard folder icons.

Table A-1: Macworld Complete Mac CD at a Glance

Folder	*Contents and Comments*
The Best of BMUG	Nearly 20MB of shareware and freeware, organized into the following categories — Business, Education, Entertainment, PowerBooks, Telecom, Utilities, Sound, and Graphics.
Jim Heid's Word Guide Online	An on-line guide to Microsoft Word 5, containing portions of *Macworld Guide To Word 5* (IDG Books, 1992). It's a companion to the book, with page number references to the most often-used sections.
Software & Demos	Demonstration versions and self-running demos of many of today's top programs. Also contains shareware from France & Associates and Software Perspectives.
Handbook Movies	You must install the QuickTime system extension (not included) to play these movies.
Digitized Sounds	You can play these sounds using the demo version of Macromedia's SoundEdit Pro included on the CD-ROM. Simply double-click any sound: When its window appears, choose the Play command or press ⌘-P. (SoundEdit Pro does not run on 68000-based Macs.)

When you open a few nested folders, the folder windows stack on top of each other — they *tile* — in a way that visually indicates the folder hierarchy. Figure A-2 "Nested Folders" illustrates this.

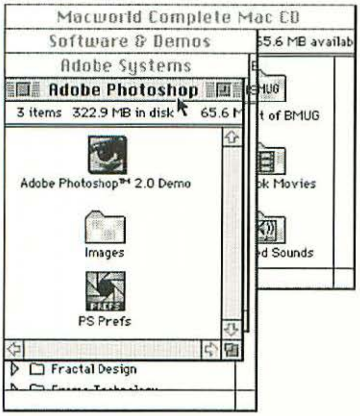


Figure A-2: Nested Folders
When you have multiple nested folders open, the folder windows create a visual display of the storage hierarchy. Here, you can see that the Adobe Photoshop folder is within the Adobe Systems folder, within the Software & Demos folder, on the *Macworld Complete Mac CD.*

Exploring the aliases

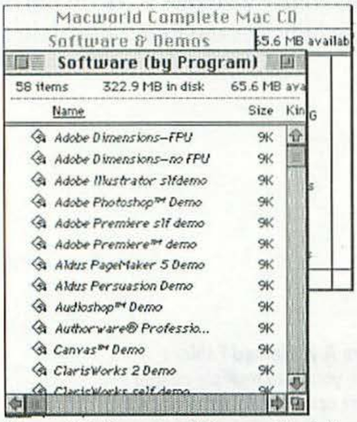
Some folders contain aliases to items that are located within other folders. For example, the Software & Demos folder contains a folder called `Software (by name)`. Inside this folder are aliases to the ready-to-run programs and demos that are scattered throughout the Software & Demos folder (see Figure A-3 "Program Aliases"). If you're just starting out with the CD, you may want to explore the `Software (by name)` folder first. It will save you much double-clicking.

The `QuickTime Movies` folder also contains a folder called `More Movies`. Inside the More Movies folder are aliases to some of the better QuickTime movies that are scattered throughout the Software & Demos folder.

Playing the QuickTime movies

The `Handbook Movies` folder contains three movies, all produced for this book. One is an interview with Frank Casanova, one of the Apple product managers responsible for the next-generation PowerPC chip. (This is the same interview that you can hear on the audio portion of the CD.)

The second movie is an audio-only movie containing this CD's audio program. If your CD-ROM drive doesn't support CD audio or if you don't have the CD-ROM hooked up to an external speaker system, you can listen to the audio program by playing this movie. The sound will play through your Mac's speaker.



Name	Size
Adobe Dimensions–FPU	9K
Adobe Dimensions–no FPU	9K
Adobe Illustrator slfdemo	9K
Adobe Photoshop™ Demo	9K
Adobe Premiere slf demo	9K
Adobe Premiere™ demo	9K
Aldus PageMaker 5 Demo	9K
Aldus Persuasion Demo	9K
Audioshop™ Demo	9K
Authorware® Professio...	9K
Canvas™ Demo	9K
ClarisWorks 2 Demo	9K
ClarisWorks self demo	9K

Figure A-3: Program Aliases The folder named `Software (by name)`, within the Software & Demos folder, contains aliases to the ready-to-run programs and self-running demos that are contained in the Software & Demos folder.

The third movie is another audio-only movie, a demonstration of Apple's PlainTalk text-to-speech technology. In this movie, you can hear several different PlainTalk voices, each of which has its own memory/quality trade-offs.

If a movie's playback appears jittery or its sound breaks up, it's because of the slow speed of CD-ROM drives. Try copying the movie to your hard disk and playing it back from there.

Listening to the Handbook audio program

If you haven't listened to the audio portion of this CD, you may want to now. If your CD-ROM player supports CD audio, be sure it's attached to a speaker system or headphones, and then open your CD remote desk accessory. You can also play the program in any stereo CD player. In either case, to hear the audio program, play Track 2.

Listening to the digitized sounds

The folder named `Digitized Sounds` contains Jim Heid's Sounds, a HyperCard stack containing numerous original sounds you can use for error beeps, presentations, HyperCard stacks, and in any program that supports sound resources.

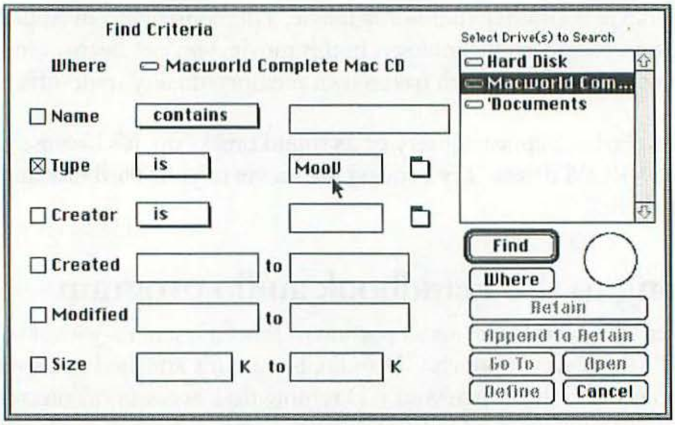
This folder also contains the theme song to this CD's audio program as well as the PlainTalk demonstration audio. Both are SoundEdit Pro files that you can open and play using the demo version of SoundEdit Pro included on this CD. (Just double-click the icon of the sound you want to hear and then choose SoundEdit Pro's Play command.)

You're welcome to use the song for noncommercial applications only, provided your application (QuickTime movie, HyperCard stack, whatever) contains this copyright message: Music ©1993 by Jim Heid. All rights reserved.

Other ways to explore the CD

Appendix C contains a list of every file on the CD. You may want to peruse this appendix to get a feel for what's on the disc. If you see a file that sparks your interest, use the Finder's Find command (System 7) or the Find File desk accessory (System 6) to quickly locate the file on the disc.

You can also use CE Software's DiskTop desk accessory (included on the CD) to locate files. If you want to use DiskTop to locate all QuickTime movies, for example, click DiskTop's Find button. In DiskTop's Find dialog box, be sure the CD is selected and then check the Type box. In the text box next to the pop-up menu, type **MooV** (see Figure A-4 "Finding Movies"). Be sure to type MooV just as it appears here — with a capital M and V.



Where ⊂⊃ Macworld Complete Mac CD

☒ Type is MooV

Figure A-4: Finding Movies You can use CE Software's DiskTop desk accessory (included on the CD) to locate all the QuickTime movies on the CD.

More important notes about the Software & Demos folder

As mentioned earlier, many of the programs in this folder are ready to run directly from the CD-ROM. Still other programs must be installed using an Installer utility included with the program.

Within this must-be-installed category are two more categories:

- Programs you can install from the CD-ROM
- Programs that must be installed from a set of floppy disks

Most of the programs that must be installed fall into the second category. These programs must be copied to floppies because their installation programs ask you to insert those floppies when they run. If you ran the installer directly from the CD-ROM, you would be asked to insert a variety of floppy disks that you don't have.

Creating a set of installation floppies

To create a set of installation floppies for a given program, note how many folders comprise the program and then set aside that many floppy disks. Give each disk the same name as its respective folder. Then copy the contents of each folder to its corresponding floppy disk.

Table A-2 lists each folder within the Software & Demos folder and describes its contents and installation routine. If all developers wrote their programs so that they could be installed (or run) from a locked volume such as a CD-ROM, these hassles wouldn't exist.

Table A-2:
Inside the "Software & Demos" Folder

Folder	*Contents and Notes*
Adobe Systems	❖ Adobe Acrobat: You must have an Acrobat viewer, such as Acrobat Exchange, to read this PDF file. ❖ Adobe Photoshop, Premiere, Illustrator, and Dimensions are ready to run.
Aladdin Systems	❖ StuffIt Lite and StuffIt Expander are ready to run.
Aldus	❖ SuperPaint, Digital Darkroom, FreeHand, and PressWise must be installed from floppy disks. ❖ Personal Press must be copied to an unlocked hard drive in order to run. ❖ Gallery Effects and the self-running demos are ready to run.
Attain Corporation	❖ In Control is ready to run.
CE Software	❖ QuicKeys Test Drive must be installed from a floppy disk. ❖ DiskTop is ready to run.
Central Point Software	❖ MacTools self-running demo is ready to run.
Claris Corporation	❖ ClarisWorks, FileMaker Pro, MacDraw Pro, and MacDraw II are ready to run, as are all self-running demos.
Connectix Corporation	❖ Macintosh Memory Guide (HyperCard stack) is ready to run, as is the CPU self-running demo.
Dantz Development	❖ Retrospect self-running demo is ready to run.
Deneba Software	❖ Canvas is ready to run.
Fractal Design	❖ Sketcher is ready to run. ❖ Painter must be copied to an unlocked hard drive.
Frame Technology	❖ FrameMaker is ready to run.
France & Associates	❖ Alphabet Zoo, Instant Math, and WorldCap are ready to run, but should be copied to an unlocked hard drive.
Gryphon Software	❖ Morph is ready to run.
Imspace Systems	❖ Kudo Image Browser is ready to run.
Jim Lewis/Golden	❖ theTypeBook is ready to run. State Graphics
Macromedia	❖ Authorware Professional and SoundEdit Pro are ready to run, as are the self-running demos.
Opcode Systems	❖ Audioshop is ready to run. ❖ Musicshop must be installed, and can be installed from the CD-ROM.
Passport Designs	❖ Pro 5, Encore, Passport Producer, and MusicTime are ready to run.
Software Perspectives	❖ All the shareware programs and stacks are ready to run. Some may require copying to an unlocked hard drive, however.

(continued on the next page)

Table A-2
Inside the "Software & Demos" Folder *(continued)*

Folder	*Contents and Notes*
Specular International	❖ Infini-D is ready to run.
Strata	❖ StrataVision 3d must be installed and can be installed from the CD-ROM. ❖ StrataType 3d must be installed and can be installed from the CD-ROM.
Symantec	❖ The Norton Utilities and SAM self-running demos are ready to run.
The Voyager Company	❖ All demos are ready to run. Copy the Expanded Book Toolkit folder to an unlocked hard drive.
WordPerfect	❖ WordPerfect is ready to run.
WriteNow	❖ WriteNow is ready to run.

About the Adobe Acrobat PDF File

The CD contains an Adobe Acrobat PDF file of Chapter 26 of this book. (The path to the file is — Software & Demos:Adobe Systems:Adobe Acrobat.) To use this file, you need a PDF viewer application such as Adobe's Acrobat Exchange.

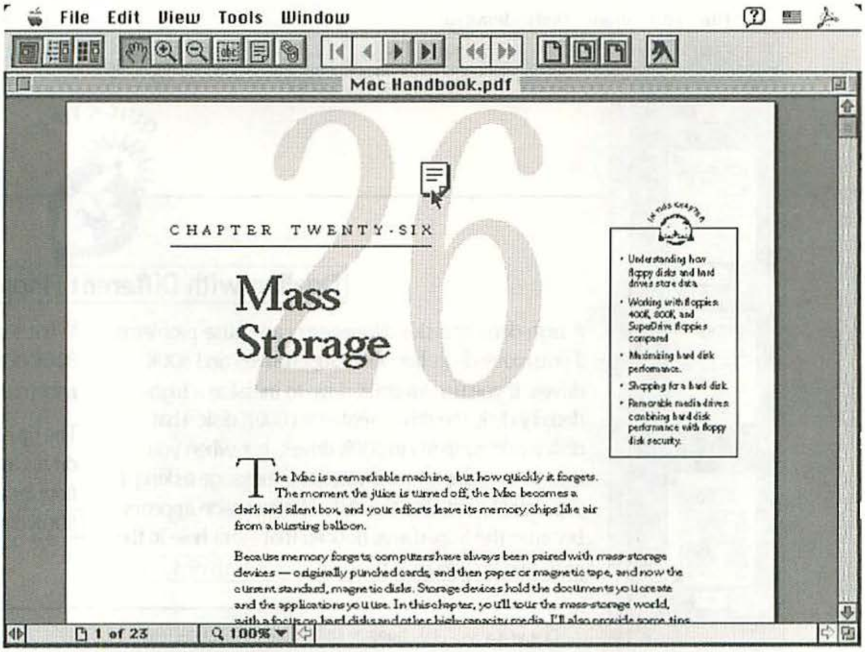
Using the PDF file

When you open the PDF file, your screen resembles Figure A-5 "The Handbook PDF." If you double-click on the small notepad icon, you can read some comments about the PDF file. (The comments were written by Adobe's Christopher Warnock, who generously created the PDF file.) This illustrates Acrobat's ability to attach comments to PDF files.

The PDF file provides thumbnails and an extensive set of bookmarks that streamline navigation through the chapter (see Figure A-6 "Thumbnails and Bookmarks"). The file also uses hypertext links to help you move between figures and sidebars.

Acrobat and memory

The reason we chose Chapter 26 for the PDF file was that it contains several beautiful technical illustrations by *Macworld*'s Arne Hurty. In this book, these illustrations are in black and white, but you can view them in their full-color glory in the PDF file.



CHAPTER TWENTY-SIX

Mass Storage

- Understanding how floppy disks and hard drives store data
- Working with floppies: 400K, 800K, and SuperDrive floppies compared
- Maximizing hard disk performance.
- Shopping for a hard disk
- Removable media drives: combining hard disk performance with floppy disk security.

The Mac is a remarkable machine, but how quickly it forgets. The moment the juice is turned off, the Mac becomes a dark and silent box, and your efforts leave its memory chips like air from a bursting balloon.

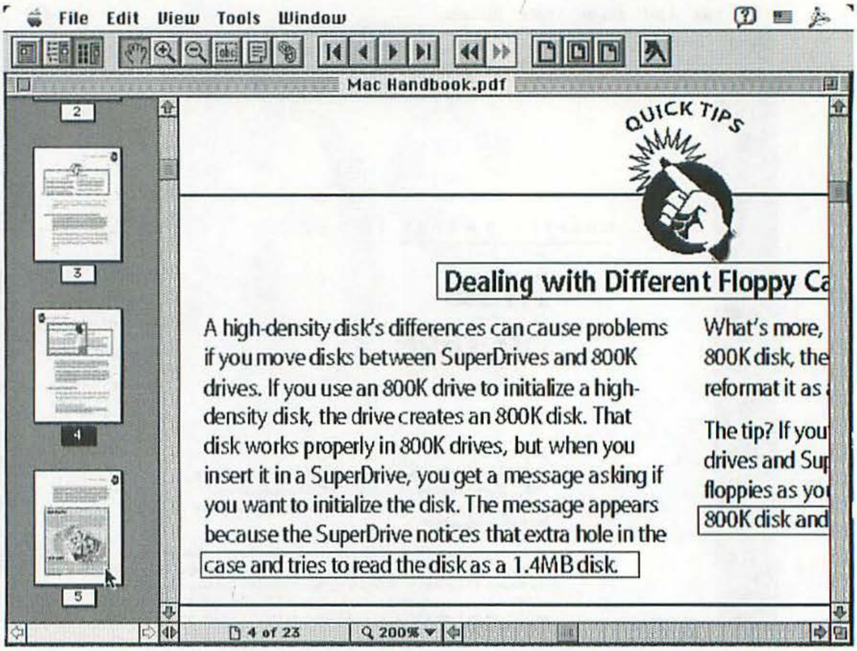
Because memory forgets, computers have always been paired with mass-storage devices — originally punched cards, and then paper or magnetic tape, and now the current standard, magnetic disks. Storage devices hold the documents you create and the applications you use. In this chapter, you'll tour the mass-storage world,

Figure A-5: The Handbook PDF When you open the sample Acrobat PDF file (using an Acrobat reader program such as Acrobat Exchange, shown here), you see the first page of Chapter 26. Double-click the small notepad icon to read some information about the PDF file.

However, some of the illustrations — particularly Figure 26-2 "Inside a Hard Drive" on page 5 of the chapter — are extremely complex and require a lot of memory. If Acrobat Exchange displays an error message when you try to view page 5, increase its memory size using the Finder's Get Info command. (Chapter 23 shows you how.)

Enjoy the CD!

I hope you enjoy the *Macworld Complete Mac CD* as much as I enjoyed putting it together. My sincere thanks and appreciation go to every individual and company who contributed, with special thanks to Frank Casanova, Steve Costa and everyone at BMUG, Dennis Cohen, Kurt Smith, Maryellen and Trixie, and Roy and Wendy. Please send your comments and suggestions to JIMHEID (AppleLink and America Online), or to 76174,556 (CompuServe). If you prefer the Postal Service, write to me in care of IDG Books, 155 Bovet Rd., San Mateo, CA 94402.

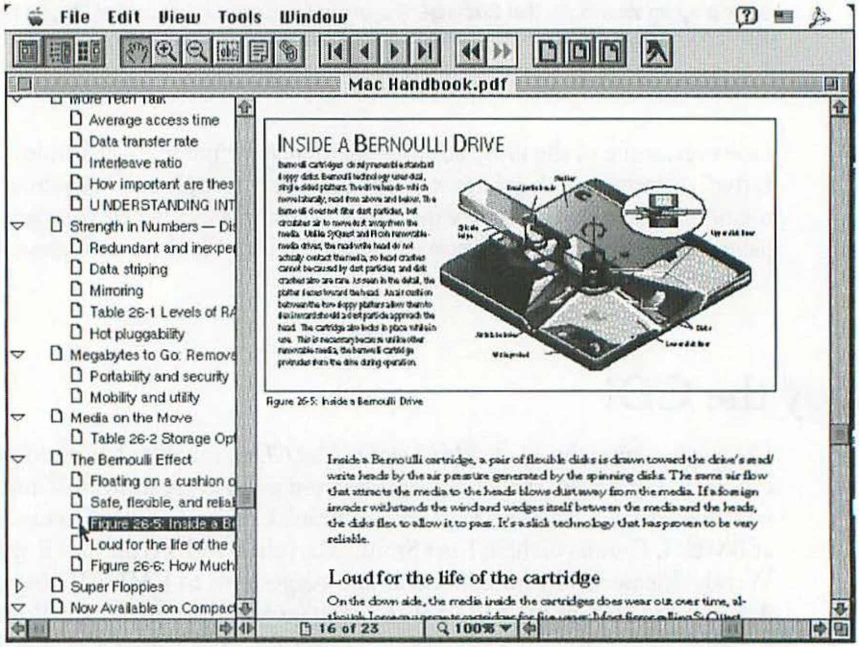


Dealing with Different Floppy Ca

A high-density disk's differences can cause problems if you move disks between SuperDrives and 800K drives. If you use an 800K drive to initialize a high-density disk, the drive creates an 800K disk. That disk works properly in 800K drives, but when you insert it in a SuperDrive, you get a message asking if you want to initialize the disk. The message appears because the SuperDrive notices that extra hole in the case and tries to read the disk as a 1.4MB disk.

What's more,
800K disk, the
reformat it as

The tip? If you
drives and Sup
floppies as yo
800K disk and



INSIDE A BERNOULLI DRIVE

Figure 26-5: Inside a Bernoulli Drive

Inside a Bernoulli cartridge, a pair of flexible disks is drawn toward the drive's read/write heads by the air pressure generated by the spinning disks. The same air flow that attracts the media to the heads blows dust away from the media. If a foreign invader withstands the wind and wedges itself between the media and the heads, the disks flex to allow it to pass. It's a slick technology that has proven to be very reliable.

Loud for the life of the cartridge

On the down side, the media inside the cartridges does wear out over time, al-

Figure A-6: Thumbnails and Bookmarks Use Adobe Acrobat Exchange's thumbnail view (top) and bookmarks view (bottom) to quickly navigate the PDF file.

APPENDIX B

How the Book and CD Were Produced

This book and its accompanying CD-ROM are examples of what you can do with Macintosh technology — the Mac was used in nearly every aspect of both projects.

Getting Words Into (and Out Of) Print

To write the original *Macworld* columns and articles upon which the book is based, I used versions 1.05 through 5.1 of Microsoft Word. I wanted each chapter to be based on the text as it appeared in print, but that introduced a problem: The oldest stories were produced by an outside typesetting firm, and electronic versions of the text files weren't available.

The answer was optical character recognition. Using Caere Corporation's OmniPage Professional and a DEST scanner, I scanned tear sheets from back issues. After much proofreading and correcting, I had the files I needed. OmniPage was even able to retain formatting such as italics and bold, which also saved some time.

My next step was to get electronic versions of the more recent material. *Macworld*'s production department supplied me with the final column files in Aldus PageMaker format, and I used PageMaker 3.01 and 4.2 to export their text to Microsoft Word 5.1 files.

After I had all the text files, I began the process of updating and expanding — adding the Quick Tips boxes and Step-by-Step sections, updating for today's Mac technology and products, and including more of Arne Hurty's beautiful informational graphics.

Spanning the miles with telecommunications

Thanks to telephone modems, I was able to dial into San Francisco-based *Macworld*'s electronic mail system (built around CE Software's QuickMail) and retrieve Arne's masterpieces. At first, I called in to the magazine's mail server using QuickMail's QM Remote program and a 2400-bps Hayes-compatible modem. Later, I switched to a 9600-bps modem that enabled me to dial directly into *Macworld's* network and even access the AppleShare file servers.

I used America Online to transmit completed chapters to technical editor Dennis Cohen in Sunnyvale, California. He edited them on-screen and returned the edited chapters to me via America Online. When I had technical questions on Apple's new AV Macs, I used Apple's AppleLink communications service to correspond with the appropriate Apple product managers and engineers. Using electronic mail eliminated annoying games of telephone tag and enabled Apple's experts to put together more comprehensive answers to my queries. I also used AppleLink's Redgate product database to get information on the products I mention in each chapter.

To create the screen shots, I used Mainstay's Capture utility, which unlike Apple's snapshot FKEY, is able to capture pulled-down menus. I used Claris' MacPaint to tweak the monochrome screen dumps and Adobe Photoshop to polish up the color and grayscale illustrations. To reduce the amount of disk space required by the illustrations (and the chapters, for that matter), I used Aladdin Software's StuffIt Deluxe and Bill Goodman's Compact Pro file-compression utilities.

Getting into production

I then submitted final chapters and art to IDG Books using AppleLink and old-fashioned overnight couriers. IDG Books turned my electronic materials over to University Graphics, a design studio in Palo Alto, California. They designed and assembled the book on the Macintosh with PageMaker 4.2a and then sent the files to the printer, which output them straight to film (using imposition software) on an imagesetter. The body text in this book is Janson. The illustrations, subheads, tables, and figure captions use typefaces from Bitstream's Zurich family, a Univers lookalike.

The CD Side

Producing the *Macworld Complete Mac CD* gave me a new appreciation for the efforts of commercial software developers and a renewed appreciation of the diverse range of jobs that a Mac can perform.

The audio program

The first task was to produce the audio program — the part that plays on any CD player (and that you can play as a QuickTime movie or SoundEdit Pro file). I had a mediocre-quality recording of the Mac's 1984 unveiling that was recorded from back in the auditorium using an inexpensive tape recorder. I wanted a higher-quality recording for this project, and Apple's public relations staff came to the rescue by sending a VHS videocassette of the event.

To record the sound from this video, I attached the audio output of a Panasonic camcorder to a Digidesign Audiomedia II card. I used Digidesign's Sound Designer II software to record and edit the Steve Jobs sound bites. All of the fade-ins and fade-outs were done digitally — no analog mixers or sliders involved. The sound bites (and all the audio in the program) were recorded directly to an FWB Hammer1000fmf 1GB hard drive using a sampling rate of 44.1KHz. (See Chapter 22 for background on digital audio concepts.)

Hi, this is Jim Heid

Okay, so I'm not Walter Cronkite. For the narration, I used a Shure microphone connected to a mixer that, in turn, was connected to the Audiomedia II card. I set up a small "sound booth" in my office by hanging some quilts from the ceiling. This improved room acoustics, but if you listen carefully during the narration, you can hear that FWB hard drive in the background.

And a-one and a-two

I'm not Quincy Jones, either, but I did cobble together the tunes that form the background music to the audio program. Both were recorded using Mark of the Unicorn's Performer MIDI sequencer. The sound source is an E-mu Systems Proteus sound module; I use an aging Ensoniq Mirage as my MIDI controller.

After sequencing the tunes, I connected the Proteus to the Audiomedia II card and played them back, recording them to disk at 44.1KHz.

Mixing music and narration

The audio program has two voice-overs — one at the beginning and one at the ending. I had planned to use Sound Designer II to mix the recorded music and narration, but found its mixing features didn't give me the control over the music volume that I wanted.

I ended up using Mark of the Unicorn's Digital Performer, a version of the Performer sequencer that can also record and play back digital audio. I imported the sound files for the narration and the music into Digital Performer, and then created volume events that faded the music at the appropriate points.

Finally, I chose the Mix command and went to lunch while Digital Performer slogged through the millions of calculations necessary to mix dozens of megabytes of digital audio data. Digital Performer isn't really intended to be used solely to mix audio files: Combining MIDI and digital audio is its forte. Still, the program worked beautifully.

The result of the mixing sessions were two new SoundDesigner-format files containing the music and voice-overs. I returned to Sound Designer II, copied the data from these new files, and pasted it into the audio program's sound file. The audio program's final size on disk is nearly 100MB.

From disk to DAT

The last step in preparing the audio program involved transferring it to a digital audio tape (DAT) cassette that would go, along with the master hard drive, to Sony's Digital Audio Disc Corporation facility in Terre Haute, Indiana, where the CDs were to be pressed.

Alas, I don't have a DAT recorder yet (and I mean yet, Maryellen), so I rented one. A mere $50 a day got me a professional-level machine from Rocket Rentals in San Francisco. I connected the Audiomedia II's digital output of the Audiomedia II card to the digital input of the DAT machine, pressed Record, and played back the audio program. Roughly 13 minutes later, I had a DAT master.

Showtime with QuickTime

I don't expect *60 Minutes* to be offering me a job any time soon, but I did have fun putting together the QuickTime movie interview with Apple's Frank Casanova. You probably don't need me to tell you this, but I videotaped the original interview in two passes. First, I interviewed Frank and recorded his responses to the questions. Then I changed the camera angle and recorded myself asking the questions.

This technique is common in the world of low-budget TV (William Hurt does it in the movie *Broadcast News*). If you've never videotaped yourself asking questions to someone who you know isn't going to answer because you're just asking the questions in order to get your face on tape, take it from me: It's embarrassing.

When I returned from Apple headquarters, I digitized the video using a SuperMac VideoSpigot. I then assembled the QuickTime movie using Adobe Premiere, creating the titles with Premiere's titling features. When compiling the final movie, I used QuickTime's Compact Video compressor, which allows for smoother playback on slower Macs.

The more formats, the merrier

An Apple publication called the *Apple CD-ROM Handbook* (Addison-Wesley, 1992) was my roadmap through the entire CD project. One of this book's recommendations is that you provide content (sounds, graphics, and so on) in multiple formats to enable the CD's users to work with the content in the ways they desire. This is the reason the CD contains the audio program and PlainTalk speech demonstration as a QuickTime movie *and* as a SoundEdit Pro file.

To convert the CD's audio program into other formats, I first had to convert it from the CD-quality 44.1KHz sampling rate to the 22KHz sampling rate that all Macs support. I used Sound Designer II to perform this sample-rate conversion. I wasn't entirely pleased with the results: The narration sounds noisy. In retrospect, I wish I would have played back the audio from the DAT recorder and digitized it at 22KHz using a MacRecorder and SoundEdit Pro. I believe this would have yielded better results.

After downsampling the audio, I saved it as an AIFF file. I then used Apple's Movie Converter utility (part of the QuickTime Starter Kit discussed in Chapter 21) to convert the AIFF file into an audio-only QuickTime movie. Next, I started up Macromedia's SoundEdit Pro, opened the AIFF file, and saved it as a SoundEdit Pro file.

Angela, Angie, Alexander, and Alex

To produce the PlainTalk speech demonstration, I used a prerelease copy of Apple's Speech Manager and an Apple developer's utility called SpeakEasy. I typed the text that I wanted each voice to recite and then used SpeakEasy (running on a PowerBook 170) to generate the audio. I connected the PowerBook 170's audio output jack to a Macromedia MacRecorder digitizer and recorded the speech at a sampling rate of 22KHz using SoundEdit Pro.

By the way, I didn't make up those voice names: Those are Apple's development names for the compressed and uncompressed female and male PlainTalk voices.

Assembling the CD Master

While I was drowning in digital audio and QuickTime, the Berkeley Macintosh Users Group was compiling the terrific shareware and freeware collection that's on the CD. The original plan was for Steve Costa, BMUG's executive director, to express the collection to me on a Sony magneto-optical cartridge. I would then copy the software from the cartridge to the FWB hard drive I used for mastering.

Alas, Murphy's Law intervened. In fact, I think Murphy now works for Federal Express, which lost the cartridge. There wasn't time to send another, so Steve sent me The Best of BMUG collection over the phone lines. Even with compressed files and 14.4Kbps modems, the transfer took three hours.

With The Best of BMUG safely on the mastering drive, I began copying the many software demos and samplers that I had collected. Some were on floppies, others on CD-ROMs, and still others on removable SyQuest cartridges.

After copying the files, I spent hours organizing them into folders, creating aliases to speed access, and testing each program to determine how (or whether) it ran from a locked volume — which is what a CD-ROM is. I also adjusted the size and position of every folder window so that it would be visible on a small Mac screen and so that windows of nested folders would create a visual path back to the top level of the CD — see the figures in Appendix A for an example.

One of the last touches involved creating the custom icons for the CD and the main folders you see when inserting it. (The custom icons in The Best of BMUG collection were created by BMUG.) I used Aldus SuperPaint for the job, copying and pasting the icons into each folder's Get Info window.

Walking the backup tightrope

A CD-ROM contains an exact image of the drive you use to assemble it. If a file is not contiguous on the drive — if it's spread across the disk instead of being stored in physically consecutive sectors — it will not be contiguous on the CD. Some fragmentation isn't a problem on a hard drive, but it's bad for a CD because of a CD-ROM drive's relatively slow seek time: Fragmented files take longer to read. This problem is particularly serious for QuickTime movies and lengthy sound files, which the Mac must read and play back in real time.

To fix the fragmentation, I backed up the entire hard drive master to tape using a tape-backup drive, and then I erased the hard drive and restored its contents. Erasing a drive I had spent weeks preparing was harrowing, but all went well. I restored the drive's contents from tape, ran the Norton Utilities' Speed Disk program, and smiled at the "no fragmented files" message.

Getting the windows right

More harrowing experiences were right around the corner. As you probably know, the Mac records the position and state of every disk and folder window you work with. If a window is open when you eject a disk or cartridge, it will appear in the same position when the disk is inserted again.

When producing a CD-ROM, you can take advantage of this to have certain windows open automatically when the CD is inserted. However, this also means you must be sure that the master hard drive's windows are in exactly the right state before shutting down for the last time. If the window of some obscure nested folder is open when you shut down before mastering, that window will automatically open on every CD-ROM you press.

After fine-tuning the window sizes and positions until my wrists hurt, I made sure that only the drive's main window was open, and then I locked the hard drive using FWB's Hard Disk Toolkit software. Next, I disconnected the drive and hooked it up to an SE to verify yet again that all the windows fit on a small screen. With that job done, I made two safety backups of the drive, packed it up, and turned it over to my wife Maryellen, who with friend and neighbor Wendy riding shotgun, hand-delivered it to IDG Books, four hours away.

Oh, no! Typos!

Once the drive arrived at IDG Books, project editor Jeremy Judson and IDG Books system specialist Rob Rubright spent the better part of a day double-clicking every icon they could find to make sure things worked properly. (When Jeremy complained to me that Passport's Encore demo wasn't playing *Silent Night* properly, I knew he'd done a thorough job.)

Leave it to an editor to find typographical errors in a "read me" file on a locked hard drive that's en route to a mastering lab. Find them he did, along with other problems. Some of the aliases didn't work: I had rearranged their original items after creating the aliases.

The production schedule prohibited sending the hard drive back to me for changes, so we enlisted the help of Dennis Cohen, the penultimate Mac expert who did the technical review of this book — and someone who has produced several CDs. After unlocking the drive, Dennis fixed the typos and the aliases, and gave me a great tip in the process: When you want to work with Finder windows without changing their sizes or positions, use System 7's keyboard shortcuts. (They're detailed in Chapter 23.)

On to Indiana — and to you

At Sony's Digital Audio Disc Corporation in Terre Haute, Indiana, a master was made that combined the digital audio program with the software on the FWB hard drive. From that master, Sony created a *one-off* — a kind of proof that we could examine to make sure everything was ready for replication. After more hours of double-clicking and testing, the disc was ready for replication.

There you have it — a remarkable collaboration involving over a dozen people scattered across hundreds of miles. And it all happened on a computer that smiles when you switch it on.

APPENDIX C

Macintosh Memory Configurations

This appendix lists the memory configurations of the Mac family. Be sure to read the notes that apply to your machine.

For details on buying and adding memory, see Chapter 31.

Model	Soldered to logic board	Number of SIMM slots	SIMM sizes supported	Possible RAM configurations	DRAM speed required	Notes
128	128K	0	N/A	128K	N/A	
512K/512KE	512K	0	N/A	512K	N/A	
Plus	0	4	256K, 1MB	1, 2.5, 4	150ns	1, 4
SE	0	4	256K, 1MB	1, 2, 2.5, 4	150ns	1, 4
SE/30	0	8	256K, 1MB, 4MB	1, 2, 4, 5, 8, 16, 17, 20, 32	120ns	4
Classic	1	2	256K, 1MB	1, 2, 2.5, 4	150ns	1, 2
Classic II	2	2	1MB, 2MB, 4MB	2, 4, 6, 10	100ns	3
Color Classic	4	2	1MB, 2MB, 4MB	4, 6, 8, 10	100ns	3
II	0	8	256K, 1MB, 4MB	1, 2, 4, 5, 8, 17, 20	120ns	1, 4, 5, 6, 7
IIx	0	8	256K, 1MB, 4MB	1, 2, 4, 5, 8, 16, 17, 20, 32	120ns	1, 4, 5
IIcx	0	8	256K, 1MB, 4MB	1, 2, 4, 5, 8, 16, 17, 20, 32	120ns	4
IIci	0	8	256K, 512K, 1MB, 2MB, 4MB	1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 16, 17, 18, 20, 24, 32	80ns	3
IIfx	0	8	1MB, 4MB	4, 8, 16, 20, 32	80ns	3, 9
IIsi	1	4	256K, 512K, 1MB, 2MB, 4MB	1, 2, 3, 5, 9, 17	100ns	3
IIvi	4	4	256K, 1MB, 2MB, 4MB, 16MB	4, 5, 8, 12, 20, 68	80ns	3, 10,
IIvx	4	4	256K, 1MB, 2MB, 4MB, 16MB	4, 5, 8, 12, 20, 68	80ns	3, 10
LC	2	2	1MB, 2MB, 4MB	2, 4, 6, 10	100ns	3

(continued on the next page)

(continued from the previous page)

Model	Soldered to logic board	Number of SIMM slots	SIMM sizes supported	Possible RAM configurations	DRAM speed required	Notes
LC II	4	2	1MB, 2MB, 4MB	2, 6, 8, 10	100ns	3, 8
LC III, Performa 450	4	1	1MB, 2MB, 4MB, 8MB, 16MB, 32MB	4, 5, 6, 8, 12, 20, 36	80ns	3, 18
Quadra 700	4	4	1MB, 4MB	4, 8, 20	80ns	3
Quadra 900	0	16	1MB, 4MB	4, 8, 12, 16, 20, 24, 28, 32, 36. 40, 48, 52, 64	80ns	3
Quadra 950, Apple Workgroup Server 95	0	6	1MB, 4MB	4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 48, 52, 64	80ns	3
Quadra 800, Workgroup Server 80	8	4	4MB, 8MB, 16MB	8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72, 76, 80, 84, 88, 92, 96, 104, 108, 112, 120, 136	60ns	3, 18, 19
Performa 200	2	2	1MB, 2MB, 4MB	2, 4, 6, 10	100ns	3
Performa 400, 405, 430	4	2	1MB, 2MB, 4MB	2, 6, 8, 10	100ns	3, 8
Performa 600	4	4	256K, 1MB, 2MB, 4MB, 16MB	4, 5, 8, 12, 20, 68	80ns	3, 10
Centris 610, Apple Workgroup Server 60	4	2	4MB, 8MB, 16MB, 32MB	4, 8, 12, 20, 36, 40, 44, 52, 68	80ns	3, 18
Centris 650	4	4	4MB, 8MB, 16MB, 32MB	4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72, 76, 80, 84, 88, 92, 100, 104, 108, 116, 132	80ns	3, 18, 19
Centris 650	8	4	4MB, 8MB, 16MB, 32MB	8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72, 76, 80, 84, 88, 92, 96, 104, 108, 112, 120, 136	80ns	3, 18, 19
Portable	1	N/A	N/A	1, 2, 3, 4, 5, 6, 7, 8, 9	100ns	4, 11, 12
Portable (backlit)	1	N/A	N/A	1, 2, 3, 4, 5, 6, 7, 8	100ns	4, 11, 12
PowerBook 100	2	N/A	N/A	2, 4, 6, 8	100ns	3, 13
PowerBook 140, 145	2	N/A	N/A	2, 4, 6, 8	100ns	3, 14
PowerBook 170	2	N/A	N/A	2, 4, 6, 8	100ns	3, 14
PowerBook 160	4	N/A	N/A	4, 6, 8, 10, 12, 14	100ns	3, 15
PowerBook 180	4	N/A	N/A	4, 6, 8, 10, 12, 14	85 or 100ns	3, 15, 16
PowerBook Duo 210	4	N/A	N/A	4, 6, 8, 10, 12, 16, 24	70ns	3, 17
PowerBook Duo 230	4	N/A	N/A	4, 6, 8, 10, 12, 16, 24	70ns	3, 17
PowerBook 165c	4	N/A	N/A	4, 6, 8, 14	85 or 100ns	3, 16

Notes

See the number under the Notes column in the preceding table, and then read the appropriate note in the following list.

1. Third-party 1MB SIMMs that have only two 1MBx4 memory chips are incompatible with these Macs. These do support 1MB SIMMs with eight 1MBx1 DRAM chips.
2. The Macintosh Classic has 1MB of RAM soldered to the main logic board. Additional RAM can be added using an expansion card. Apple's Macintosh Classic 1MB Memory Expansion Card has 1MB of additional RAM and two SIMM connectors.
3. These Macs have 32-bit clean ROMs and therefore can access more than 8MB of physical RAM under System 7.
4. The ROMs in these systems are not 32-bit-clean, but with the 32-Bit System Enabler (under System 7.1) or MODE32 (with versions of System 7 prior to 7.1), these Macs can run in 32-bit mode and access more than 8MB of physical RAM.
5. The Mac II and Macintosh IIx require special 4MB SIMMs. Be sure to specify your Mac model, and when ordering verify that the vendor knows the difference (the SIMMs contain a programmable-array logic — PAL — chip). The Mac II requires the Macintosh II FDHD Upgrade to use 4MB SIMMs.
6. In order to access more than 8MB of physical RAM, the Mac II must have a PMMU installed, and you must use the 32-Bit System Enabler (or MODE32 with versions of System 7 prior to 7.1).
7. The Mac II will not start up if you install 4MB SIMMs in bank A. You'll hear the "chord of death" at startup (see Chapter 29), indicating a hardware failure. Install 4MB SIMMs in bank B, and use 256K or 1MB SIMMs in bank A.
8. These Macs can address a maximum of 10MB of RAM. When the SIMM slots are filled with 4MB SIMMs, the lower 2MB of DRAM on the logic board can't be addressed.
9. The Macintosh IIfx requires 64-pin SIMMs.
10. Only the eight-chip 16MBx1 SIMMs have been tested on the Macintosh IIvi and Macintosh IIvx.
11. The Macintosh Portable has 1MB of RAM soldered to the main logic board. You can add more RAM using an expansion card. The Macintosh Portable memory expansion card can have from 1MB to 4MB of RAM. The backlit Macintosh Portable memory expansion card can have 1MB to 3MB of RAM.

12. If the processor-direct slot (PDS) is used for other peripherals, the maximum RAM is 5MB for the Macintosh Portable and 4MB for the backlit Macintosh Portable, using a memory expansion card.

13. The PowerBook 100 has 2MB of pseudostatic RAM on the main logic board and one expansion slot. Additional RAM can be added using a RAM expansion card for a maximum of 8MB.

14. The PowerBook 140, 145, and 170 have 2MB of pseudostatic RAM on the main logic board and one expansion slot. The 4MB configuration shipped by Apple has a 2MB RAM expansion card installed. To expand up to 8MB, replace the 2MB RAM expansion card (if installed) with either a 4MB or 6MB RAM expansion card.

15. The PowerBook 160 and 180 have 4MB of pseudostatic RAM on the main logic board and one expansion slot. The 4MB configuration shipped from Apple has no RAM expansion card installed. To expand up to 6MB, 8MB, or 14MB, install a 2MB RAM expansion card, 4MB RAM expansion card, or 10MB RAM expansion card, respectively.

16. For the PowerBook 165c and 180 only, Apple recommends 85ns pseudostatic RAM. Use of 100ns pseudostatic RAM results in a performance decrease of approximately five to ten percent.

17. The PowerBook Duo 210 and Duo 230 have 4MB of low-power DRAM on the main logic board and one expansion slot. The 4MB configuration shipped from Apple has no RAM expansion card installed. To expand up to 8MB or 12MB, install a 4MB RAM expansion card or 8MB RAM expansion card, respectively.

18. These systems use 32-bit wide, 72-pin SIMMs not used in earlier Macs.

19. These systems can use a *memory interleaving* technique that is activated when pairs of same-size SIMMs are used. This can improve performance five to ten percent. Also, the Centris 610, Centris 650, Centris 660AV, Quadra 800, and Quadra 840AV can accept any supported SIMM size in any SIMM socket, in any order. These Macs do not support 1MB, 2MB, or 64MB 72-pin SIMMs.

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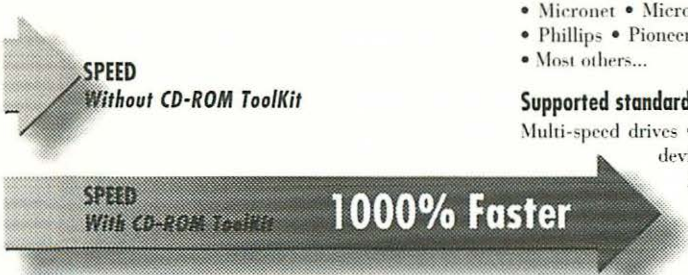

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ADDENDUM

A

Late Breaking News

My neighbor, an artist, has written a book on drawing that will probably be as up-to-date a hundred years from now as it is today. The Mac world changes a bit faster. This section describes some changes that took place in the fall of 1993.

So Long, Centris

Faced with criticism that its product line was too large and complex, Apple pruned the Mac family tree and did away with the Centris name. The Centris 660AV became the Quadra 660AV, the Centris 610 became the Quadra 610, and the Centris 650 turned into the Quadra 650. The Quadra 660AV is identical to its predecessor, but the 610 and 650 each received a dose of speed. Apple boosted the clock rate of the 610 from 20MHz to 25MHz and also added an Ethernet networking port. The 650's clock rate was bumped from 25MHz to 33MHz, yielding an affordable computer that's actually faster than the Quadra 800 and 950. A new Quadra model, the 605, also runs at 25MHz, but uses the 68LC040, which lacks floating-point math circuitry. (If this paragraph reads like Greek, see Chapter 1's "Concepts and Terms" section.)

At the same time, Apple introduced the LC 475 and the Performa 470 series, all of which are based on the Quadra 605 design. The Performa 550, on the other hand, is a faster version of the LC520, providing a 33MHz clock rate (instead of 25MHz).

Finally, the PowerBook Duo line received a shot in the arm. The PowerBook Duo 250 provides an active-matrix screen, and the Duo 270c introduces color to the Duo line. Upgrades from the Duo 210 (now discontinued) or 230 to either the 250 or 270c are available.

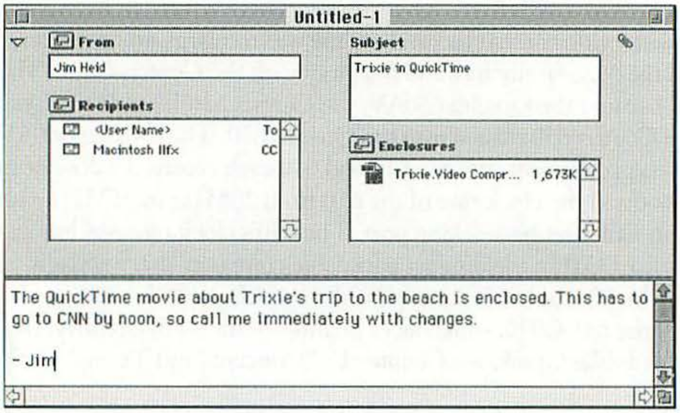
Hello, System 7 Pro

The other big news in the fall of 1993 was System 7 Pro, an enhanced version of System 7 that includes QuickTime and AppleScript (both discussed in earlier chapters) as well as PowerTalk, a new set of workgroup-oriented services built around the Apple Open Collaboration Environment, or AOCE. (If you aren't familiar with basic networking jargon, see Chapter 33.)

Built-in electronic mail

Just as System 7 file sharing gives Macs built-in peer-to-peer file sharing, System 7 Pro and PowerTalk give Macs built-in peer-to-peer electronic mail.

System 7 Pro's AppleMail program lets you create and send messages as well as read incoming ones (see "Checking AppleMail"). As with e-mail products such as CE Software's QuickMail, you can enclose files with messages. Because PowerTalk works in a peer-to-peer fashion, you don't need to set aside a Mac to act as a mail server. When you want the increased performance and reliability that a central server provides, you can use Apple's PowerShare Collaboration Server, which can also run along with the AppleShare file-serving software discussed in Chapter 33.



From: Jim Heid

Subject: Trixie in QuickTime

Recipients:
<User Name> To
Macintosh IIfx CC

Enclosures:
Trixie.Video Compr... 1,673K

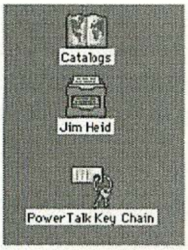
The QuickTime movie about Trixie's trip to the beach is enclosed. This has to go to CNN by noon, so call me immediately with changes.

- Jim

Checking AppleMail System 7 Pro's AppleMail application lets you send messages and files to other users on your network.

The real power of PowerTalk

PowerTalk and AOCE represent more than just built-in e-mail. AOCE provides a library of standard features and software routines that developers can use to add electronic mail and other network collaboration features to their programs. When a program supports PowerTalk, it can provide direct access to all the communications services you use. From local e-mail to online service e-mail to faxes, PowerTalk brings communication to the Mac's desktop.



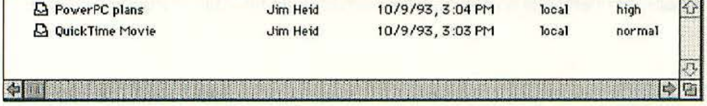
New Desktop Additions System 7 Pro's PowerTalk adds these new icons to the Mac's desktop.

PowerTalk also adds the following new icons to the Mac's desktop (see "New Desktop Additions"):

- The *Mailbox* holds your incoming and outgoing correspondence. (After you set up PowerTalk for the first time, the icon's name changes to your name.) The Mailbox's *In Tray* window holds incoming mail messages (see "Picking Up the Mail"). In PowerTalk's world, the In Tray is the central repository for incoming mail — regardless of that mail's place of origin. Your AppleLink and America Online e-mail appears in the same place as incoming faxes and network e-mail — no need to manually check a variety of services to keep in touch.

- *Catalogs* hold icons that represent the network services (printers, file servers, and so on) you use as well as the people you keep in touch with — their names, their addresses (both physical and electronic), even their hobbies and favorite foods, if you like. Catalogs can contain contact information for individual users or for groups of users — much as a file server can store access privileges for individual users and for groups.

- The *Key Chain* provides a single logon procedure for the communication and network services you use, whether they're on your office network or on an online service. True to its name, the Key Chain puts all your keys in one place. After you unlock your key chain, you can access all the services it knows about without having to constantly type passwords. You can lock the Key Chain when you're going to be away from the computer for a while, and you can use the PowerTalk Setup control panel to lock the Key Chain automatically after a period of inactivity.



2 items

✓	Subject	Sender	Date Sent	Location	Priority
	PowerPC plans	Jim Heid	10/9/93, 3:04 PM	local	high
	QuickTime Movie	Jim Heid	10/9/93, 3:03 PM	local	normal

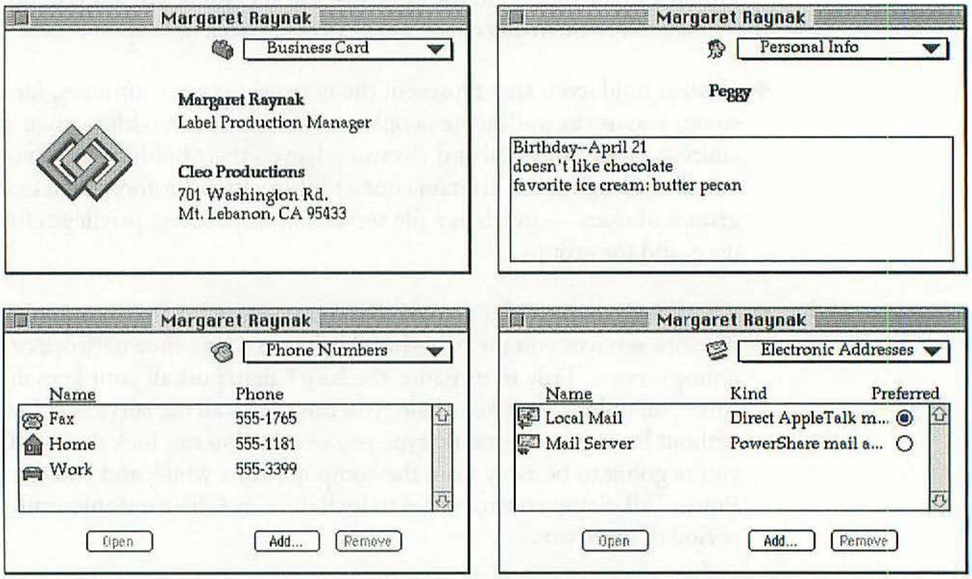
Picking Up the Mail The In Tray shows the mail you've received. With the Mailbox menu's Preferences command, you can specify that your Mac notify you when new mail arrives by displaying a dialog box, playing a sound, flashing the Apple menu — or by doing all three.

Keeping in touch with information cards

To help you keep track of contact information and send documents, PowerTalk provides a special type of document called an *information card.* An information card can reside in a catalog, on your desktop, on a file server, or within a certain folder on a disk.

An information card contains four electronic pages, each of which stores a different type of information (see "Give Me Information"). After you create an information card for a person on your network, you can send a file to that person by dragging the file's icon to the person's information card.

If you always send a daily memo to a certain group of people, create a *group icon,* and then drag each user's icon to it. Thereafter, you can transmit the memo by dragging its icon to the group icon. The real power of PowerTalk becomes apparent when you consider that some of the members of the group to which you are sending the message may be on your office network while others are across the country, at the other end of modem lines or fax machines.



Margaret Raynak
Label Production Manager

Cleo Productions
701 Washington Rd.
Mt. Lebanon, CA 95433

Peggy

Birthday--April 21
doesn't like chocolate
favorite ice cream: butter pecan

Name	Phone
☎ Fax	555-1765
Home	555-1181
Work	555-3399

Name	Kind	Preferred
Local Mail	Direct AppleTalk m...	●
Mail Server	PowerShare mail a...	○

Give Me Information Information cards hold contact details about users or groups. Shown here are the four electronic pages a card contains (from top to bottom): a *business card* page for basic contact information; a *personal info* page for listing birthdays, shoe sizes, and other essential data; a *phone numbers* page for listing telephone numbers; and an *electronic addresses* page for listing e-mail and fax contact information.

Streamlining collaboration with personal catalogs

PowerTalk lets you create any number of *personal catalogs,* each of which can hold frequently used information cards. If a certain project requires you to work with certain network resources and people, you can create a personal catalog for that project. Just as folders let you group related documents together, personal catalogs let you group related information cards together.

Programs that support PowerTalk can access the catalogs you create. With a PowerTalk-compatible word processor, you can, for example, fax a document to someone whose fax number was stored in a catalog. You can use the Get Info command to designate a certain catalog as the *preferred catalog* — the one PowerTalk-compatible programs use unless you specify otherwise.

PowerTalk automatically places one personal catalog, named *Personal Catalog,* in the Apple menu for you. When a catalog window is open, a Catalogs menu appears whose commands let you create new user or group information cards as well as create new personal catalogs. When a catalog window is open, the Finder's View menu lets you narrow down the display of catalog items to view only certain types, such as file servers. A Find In Catalog command in the Apple menu also makes it easier to find items in catalogs.

Sign in, please

A common office chore involves signing off on pieces of paper, such as purchase orders. PowerTalk provides a digital signature feature that lets you electronically sign documents. A document's recipient can then be certain that the document wasn't altered.

Is System 7 Pro For You?

If you work alone, you probably won't want to bother upgrading to System 7 Pro. If you work on a small network and you haven't yet taken the e-mail plunge, System 7 Pro is a good place to start. If you're on a large network that already uses an e-mail system, chances are the e-mail software's developer is or already has enhanced its product to take advantage of PowerTalk.

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I use ☐ DOS [20] ☐ Windows [21] ☐ OS/2 [22] ☐ Unix [23] ☐ Macintosh [24] ☐ Other: [25] ____________ (please specify)

I would be interested in new books on the following subjects:
(please check all that apply, and use the spaces provided to identify specific software)

☐ Word processing: [26] ☐ Spreadsheets: [27]
☐ Data bases: [28] ☐ Desktop publishing: [29]
☐ File Utilities: [30] ☐ Money management: [31]
☐ Networking: [32] ☐ Programming languages: [33]
☐ Other: [34]

I use a PC at (please check all that apply): ☐ home [35] ☐ work [36] ☐ school [37] ☐ other: [38] ____________

The disks I prefer to use are ☐ 5.25 [39] ☐ 3.5 [40] ☐ other: [41] ____________

I have a CD ROM: ☐ yes [42] ☐ no [43]

I plan to buy or upgrade computer hardware this year: ☐ yes [44] ☐ no [45]

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About the Author

Jim Heid is an award-winning columnist for *Macworld* magazine and serves on the faculty of the prestigious Center for Creative Imaging. He is the author of the bestselling *Macworld Guide To Microsoft Word 5/5.1.*

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